This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

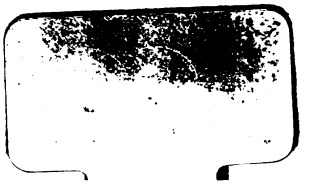
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

600045745V

1843 d. 31



University Library
Oxford

RESULTS

OF

ASTRONOMICAL OBSERVATIONS,

MADE

AT THE OBSERVATORY OF THE UNIVERSITY,

DURHAM,

FROM OCTOBER, 1849, TO APRIL, 1852,

UNDER THE GENERAL DIRECTION OF

THE REV. TEMPLE CHEVALLIER, B.D., F.R.A.S.,

PROFESSOR OF MATHEMATICS AND ASTRONOMY.

BY

R. C. CARRINGTON, ESQ., B.A., F.R.A.S.,

OBSERVER IN THE UNIVERSITY.

DURHAM:
PRINTED BY W. E. DUNCAN AND SON, COUNTY ADVERTISER OFFICE.

1855.

INTRODUCTION.

THE Observatory of the University of Durham was built in the year 1841, principally by private subscription. The regulations of the University (Title XV., Section iii.) provide that its affairs be under the direction of a Board of Curators, consisting of the Warden, the Professor of Mathematics and Astronomy, the Proctors, the Reader in Natural Philosophy, and two other persons nominated annually; that the Warden shall convene the Board once at least in every Term; that the Curators shall visit the Observatory once at least in every year; that the Observer shall reside at the Observatory, shall be an unmarried man, nominated by the Professor of Mathematics and Astronomy, with the concurrence of the Curators and the approval of Convocation; and that he shall be removable by the same authorities.

This second volume of the Durham Observations comprises the period during which I held the appointment of Observer; namely, from October 1849, to April 1852.

My acquaintance with the use of astronomical instruments commenced in the autumn of 1849, when my valued friend Professor Challis allowed me, during a temporary residence at Cambridge, to make myself familiar with the use of the instruments under his charge, and with the processes of reduction there followed. My practice has consequently been very closely similar to that pursued at Cambridge, modified gradually in some particulars by my own experience of the peculiar necessities of the instruments at Durham. Such points as it appears desirable to notice specially will be found under the head of the separate instruments.

From October, 1849, to the beginning of May, 1850, the observations were almost exclusively meridianal; thenceforward, with little exception, equatoreal. The objects observed in the meridian during 1849 and the spring of 1850 were

for the most part stars from the catalogue of the British Association, of which modern observations were wanted, the moon and moon-culminating stars, and the planets Mars, Jupiter, Saturn, Uranus, and Neptune. After April, 1850, the objects were mainly such of the comparison-stars used for the Equatoreal as were not too faint for the transit. The objects observed with the Equatoreal were the planets Pallas, Juno, Hebe, Iris, Flora, Metis, Hygeia, Parthenope, Victoria, Egeria, Irene, and Eunomia, and the comets commonly called Petersen's third, Bond's, D'Arrest's, Brorsen's fourth, and Encke's.

The publication of the Equatoreal observations in a provisional state took place from time to time in the monthly notices of the Royal Astronomical Society of London, and in the pages of the Astronomische Nachrichten of Altona. The collective final publication has been since then delayed by the necessity of looking elsewhere for aid in determining the positions of the comparison-stars, the transit-circle at Durham being of too small size for observing by far the greater portion. At the last meeting of the Curators, before my connexion with the University ceased, I made an offer to provide for this want as far as I was able, and to superintend the future revision and publication of my observations in a final form, so soon as the star-places were supplied. In consequence of my application, Professor Smyth, of Edinburgh, has most kindly observed 76 of those stars in both elements, and 55 others in right ascension. The Astronomer Royal also supplied me with the places of 44; and I have determined 53 myself at the Observatory since erected by me at Redhill, in Surrey. A few of the number have been observed at two Observatories; some few others did not need re-observation; the total number being 221. Two years and a half have elapsed in waiting for these star-places, and the value of the Equatoreal observations to the computer has been necessarily much lessened thereby; but this circumstance was beyond my control. It is hardly necessary to instance the case of the first comet of 1850, the observations of which now appear many months after the definitive conclusion of its orbit. I have nevertheless continued to regard it as a professional duty to watch over my old observations to the last, although now sufficiently occupied elsewhere.

Meteorological observations were also constantly kept up at the hours of 9 A.M. and 9 P.M. (in my absences on vacation, by deputy); the barometer, dry and wet-bulb hygrometer, maximum and minimum thermometers, direction and force of wind, and the fall of rain, being noted. These observations were communicated quarterly to the Registrar-General of Births, Marriages, and Deaths, at Somerset House, London, in tables prepared under the direction of James Glaisher, Esq.

ON THE LATITUDE, LONGITUDE, AND HEIGHT ABOVE SEA-LEVEL OF THE OBSERVATORY.

The latitude was determined in the year 1843 from a large number of direct and reflected observations of α, δ, and λ Ursæ Minoris, and found to be 54°. 46′. 6″, 2. On the 25th of March, 1850, I took a single series of ten consecutive direct and reflected observations of Polaris, from which there resulted the value 54°. 46′. 6″, 4, in sufficiently close agreement with the adopted value. As this element was never made use of in the reduction of circle observations, it was considered unnecessary to bestow more labour upon its correction.

The longitude was concluded by my predecessor from observations of the moon and moon-culminating stars, compared with corresponding Greenwich observations, to be $6^m\ 19^s$, 1 West. Additional observations of the same kind were from time to time made by myself, of which 20 are available for longitude. The mean result of these, given on page 20, is $6^m\ 17^s$, 3 with a considerable probable error. But a result on which much more reliance may be placed was obtained in the months of January and February, 1851, by means of chronometers conveyed twice to and from Greenwich by railway. The result of this operation, an account of which is given in the present volume, was $6^m\ 19^s$, 75, which has since been adopted as preferable to any other determination hitherto obtained.

The height of the Observatory above the mean sea-level depends on two series of levellings. The officers of the Ordnance Survey have, among their other fixed marks in the city, a crow-foot mark cut in the N.E. face of the N.W. tower of the Cathedral, at about two feet above the soil. The height of this mark above sea-level they call 215,8 feet. Arthur Beanlands, Esq., C.E., and formerly Observer in the University, many years ago made a careful level survey of the whole town of Durham, and at the same time determined the difference of height of certain points in the Observatory above certain of his bench-marks in the town. On receiving from the survey in 1851 their determination of the height of the Cathedral mark, Mr. Beanlands was requested to connect this point with his own marks, which he at once did. The result of this compound operation is, that the upper surface of the stone caps of the piers of the transit-circle is 354,5 feet above the mean sea-level, that the floor of the transit room is very nearly 350 feet, and the barometer cistern 352,4 feet above the same.

Thus are obtained the following data for determining the position of the Observatory:—

Astronomical latitude ..... 54°. 46'. 6", 2, North.
Longitude from Greenwich..... 6^m. 19^s, 75 West.
Height of the Barometer cistern above mean sea-level ..... 352, 4 feet.

OF THE INSTRUMENTS.

The Observatory possesses a small transit-circle, an astronomical clock by Hardy, an 8 feet Equatoreal by Fraunhofer, and a second Equatoreal of 7 feet presented by the late Duke of Northumberland, besides some smaller instruments not in actual use.

1. Of the Transit-circle. The object-glass is of 3¼ inches aperture, and 4 feet 2 inches focal length. The eye-piece commonly used magnifies about 100 times. The horizontal axis is of gun-metal, 30 inches in length: the pivots 1¼ inch in diameter, one bored, the other not. On the half-axis which has the unbored pivot is placed the divided circle, at 3 inches from the bearing, there being no corresponding load on the other half, no clamps, and no counterpoise arrangement. The diameter of the circle is 2 feet. It is independently divided on silver to every 5', and read by one pair of microscopes at the extremities of a horizontal diameter. There is one pair of microscopes fixed on the upper surface of one pier, and another pair on the other pier, which are not moved when the instrument is reversed; one pair being in use, and the other out of use for the time. The system of wires consists of seven vertical fixed wires, two fixed horizontal wires, and one carried by a micrometer screw. There was no contrivance by which the observer could regulate the amount of light admitted into the field for the purpose of illumination: this defect was frequently felt, and limited the use of the instrument. The transit-circle room is on the second floor of the building. A single massive pier is built to within a few inches of the floor, on which are placed two solid blocks of stone supporting the East and West ends of the axis. Directly facing the East pier, and at a distance of three feet six inches from it, is a window, which latterly was screened by a stout storm-blind. The Ys on which the pivots rested were of brass, and of a construction not unusual, the one admitting of adjustment in level, the other in azimuth. These arrangements experience has shown to be objectionable, the instrumental adjustments being liable to constant fluctuation of a most troublesome amount: and they are

commented on here that those who require information on such subjects may avoid proved sources of perplexity. The first change made was to substitute a new pair of Ys, of more massive construction, admitting of no screw-adjustment in azimuth, but both furnished with precisely similar means of adjustment in level. The object was to equalise expansions by studying symmetry. The effect was that, whereas formerly the adjustment-screws were frequently in requisition, from the time that the final adjustment was effected after the mounting of the new Ys till the time that I left the Observatory, no re-adjustment was required, and the fluctuations were decidedly lessened in amount. We were led to block up the East window, by noticing that the fluctuations in level were accountable for, in a general way, on the supposition that, from some cause, the East pier expanded and contracted relatively more readily than the West, and this was naturally attributed to the facility of radiation afforded by the window. The success of this alteration was not so well ascertained from its having been carried out after I had turned from meridian to equatoreal observations; but it was believed to have contributed sensibly to the increased stability of the instrument. Turning from the construction to the state of the instrument, it must be mentioned that I found the pivots to be greatly worn; and as the working level admitted of being applied only in certain positions of the telescope, I applied for and was supplied with another, furnished with legs of sufficient length to allow of the telescope being turned completely round beneath it. The result of three experiments with this striding-level exhibited the following differences of apparent level error, for different settings of the telescope, from the mean level error at any time:

C. R.	Diff.	C R.	Diff.	C. R.	Diff.	C. R.	Diff.
°	″	°	″	°	″	°	″
0	— 1, 01	90	— 1, 60	180	+ 0, 04	270	+ 0, 35
10	— 0, 94	100	— 1, 74	190	+ 0, 15	280	+ 0, 35
20	— 1, 03	110	— 1, 50	200	+ 1, 03	290	+ 0, 42
30	— 0, 81	120	— 0, 64	210	+ 1, 43	300	+ 0, 48
40	— 0, 52	130	+ 0, 09	220	+ 1, 60	310	+ 0, 52
50	— 0, 28	140	+ 0, 37	230	+ 1, 58	320	+ 0, 61
60	— 0, 40	150	+ 0, 24	240	+ 1, 34	330	+ 0, 42
70	— 0, 94	160	+ 0, 18	250	+ 0, 88	340	— 0, 13
80	— 1, 38	170	— 0, 04	260	+ 0, 61	350	— 0, 50

the pierced pivot being East at the time. Roughly speaking, one-half of the above quantities are due to error of form of that part of the pivots which was beneath the inverted Y feet of the level, the other half only being effec-

tive. No corrections were applied to observations for error of form of pivots But the evil was in a great degree got rid of latterly, by taking advantage of the substitution of new Ys, and by having the surface of the Y made of double its former width, and then cutting away the part nearest to the flange of the horizontal axis, so as to bring a new portion of the pivot into use. This change was not made till after the observations of stars on pages 3, 4, and 5 were finished; but happily it was carried out before the chronometric comparison of our longitude with Greenwich was effected, in which the absolute determination of time, unaffected by such source of error, was essential. The divided circle was a good deal tarnished, and at times there was some difficulty in reading off the divisions; but, on the whole, there was little to say against it.

In the circumstances related above, the only course to pursue appeared to be to use the instrument more strictly as a differential instrument, and this idea was always kept in view. The level-error was taken as often as twice a week, and the azimuth error found from Polar stars on almost every night of observation; and by further selecting for the determination of clock-error and circle-reading of the Polar point such Nautical Almanac stars as lay most nearly on a parallel with the objects whose positions were to be found, results were obtained on which very fair reliance could be placed, although work of any pretension could not be hoped for.

2. The clock (by Hardy) did its part most satisfactorily. It was once cleaned during the time that I used it. The beat was very sharp and audible, and the average difference of two consecutive daily rates not more than $0^s,15$; double that quantity being an extreme value. This clock stood in the S.E. angle of the transit-room, and, being visible from the dome above, was also used in Equatoreal observations. As, however, from the elevated position of the Observatory, noise caused by wind was a frequent source of annoyance, a hearing-tube of gutta percha, about thirty-five feet in length, was supplied at my request, and led from the clock-case into the dome, which was often of essential use.

3. Of the Fraunhofer Equatoreal. The object glass is of $6\frac{1}{2}$ inches aperture, and 8 feet 3 inches focal length. The tube is of mahogany. The mounting is of the kind commonly called the German: the length of the polar axis between its upper and lower bearings 2 feet 4 inches, its diameter $1\frac{3}{4}$ inches; the hour circle is of 11 inches diameter, the circles for clamping in R.A. and N.P.D. of 9 inches diameter only. The whole is placed on a massive stone pillar passing through the centre of the building, the dome being on the top of the house. The insufficient size of the clamping circles, and a want

of stiffness in the mounting generally, was felt as a continual difficulty in the use of the instrument, the tendency to unchecked vibration from a breath of wind, or any other source of disturbance, being extreme. In the N.P.D. direction I was able to annihilate these tremors completely by applying a light mahogany rod, as a brace, between the eye-end of the telescope and the lower end of the polar axis; but in the R.A. direction I could devise no method of applying a tension such as was required, and had to content myself with practising all possible delicacy of touch in handling the micrometer. It is therefore necessary to point out that, although the measures of difference of N.P.D. were affected by no known source of error, it was otherwise with the measures of difference of R.A., and that the latter must be looked upon as of inferior accuracy.* The instrument was not provided with a clock-movement. The eye-piece commonly used was a wire-micrometer, provided with a position-circle, the wire-frame consisting of five fixed meridianal wires, and two moveable wires at right angles to these carried by antagonistic screws, the threads of which were sensibly equal, for bisection in N.P.D. The wires were illuminated on a dark ground at night by a small side-lamp, and were always well seen. Of the five fixed wires the first, third, and fifth only were generally observed upon, the intervals being too close in most cases for all to be used. For very faint objects a ring-micrometer of radius 444″ was occasionally used, but never when it could be avoided. Sometimes also, when an object would bear no illumination, recourse was had to a micrometer furnished with five meridianal bars and two moveable bars for bisection; but this also was never used unless it was absolutely necessary, firstly, because by having no position-circle, the bars could not be very precisely set, and secondly, from the difficulty of estimating when a diffused object, such as a faint comet, was really bisected by a bar, one-half of its area being of necessity concealed at the moment. A double image-micrometer by Simms was also provided, but, as I never had occasion to employ it, I need not refer further to it.

4. The Northumberland Equatoreal was commonly regarded as a supernumerary, to be used when two Equatoreals were required, or for some special object. The Fraunhofer being the superior instrument, I never made use of the Northumberland myself: it was, however, very frequently used by Professor Chevallier, and did good service in his hands at Goteborg, in Sweden, whither it was conveyed on the occasion of the total eclipse of the sun in July, 1851.

* Prof. Chevallier states that this unsteadiness in the telescope in R.A. has been in a great degree corrected since my observations were made.

OF THE TRANSIT OBSERVATIONS.

It was my practice in all cases to take a second from the clock face before sitting down to observe a transit, to continue the counting mentally, and to refer again to the clock at the end. In observing quickly-moving stars, the time of passage over a wire was estimated to tenths of seconds in the usual way by noticing the position of the wire relatively to that of the star at the beat preceding and next succeeding its passage: for Polaris and the Polar stars, it was my habit to observe the half-second at which the little disk first made contact with the wire, and at which it again parted from it, and to take the mean of the two times as the time of passage.

The wire-frame was in the same state as it was left in by Mr. Thompson, and no accident to a wire happened during my use of it. The intervals of the wires were computed anew by me on more than one occasion, using the same formula as is employed at Cambridge for finding the Equatoreal intervals from the observed transits of circumpolar stars, and conversely.

The following were the Equatoreal intervals from the mean of the whole seven found and used, wire A being the first wire passed by a South star when the illuminated end of the axis was East.

	To December, 1850.	From January, 1851.
	s.	s.
A	− 37, 432	− 37, 478
B	− 18, 752	− 18, 778
C	− 9, 365	− 9, 353
D	+ 0, 034	+ 0, 082
E	+ 9, 372	+ 9, 376
F	+ 18, 728	+ 18, 739
G	+ 37, 417	+ 37, 412

By means of these numbers imperfect transits were corrected to the mean wire, in the case of the Polar stars by special tables computed for each case, by the formula

$$\sin. 15.\, t = 15.\, h^s.\, \sin. 1''.\, \text{cosec. } \delta.$$

where h is the Equatoreal interval, and δ the N.P.D.; in the case of stars distant from the pole, by the simpler formula

$$h^s.\, \text{cosec. } \delta.;$$

in the case of the Sun or a planet, by the formula

$$h^s.\, \text{cosec. } \delta.\, \frac{3600 + I}{3600},$$

I being the hourly increment of R.A. in seconds of time; and in the case of the Moon, by the formula

$$h^s.\ \text{cosec. geoc. } \delta.\ \frac{3600 + I}{3600} \cdot \frac{\text{sin. geoc. Z.D.}}{\text{sin. app. Z.D.}}$$

parallax being taken into account. The planets Mars, Jupiter, and Saturn were observed by taking alternate limbs at alternate wires.

The collimation-error was tolerably steady for the most part, and was always of moderate amount. There were two fixed marks in the grounds intended to be used for its determination, which could be seen at a depression of 15°, but as they were never very distinct, I preferred to reverse the telescope on the sharply-defined edge of a chimney which was visible in the telescope near the centre of its field when nearly horizontal and pointed South. When the sky was bright, and the air tranquil, this formed a very fair mark. For the observation a double image dynameter eye-piece by Dollond was made use of, the value of one revolution of the screw of which was found, by repeated measures of the known intervals of the wires, to be 79,"29. Diurnal aberration was combined with the adopted collimation-error and applied together with it in all cases by the usual formula.

In the year 1850, I found that there was a spot in a field, about 1½ mile north of the observatory, where a small stone pillar might be very conveniently placed for the support of a meridian mark which would be much better seen than any before at command. It being found on enquiry that the field in question belonged to W. L. Wharton, Esq., one of the Curators, application was made to him for leave to erect a small mark and to visit it from time to time. Mr. Wharton not only complied willingly with this request, but, at his own expense, erected a handsome obelisk of above sixty feet in height, of substantial masonry, as it was considered, on examining the site chosen, that such an object might at the same time be rendered ornamental to the neighbourhood. I feel that it is due to him that I should, in this place, thank him for the liberal spirit in which he provided a supply so much in excess of my demand.

The level-error was, as has been before named, very fluctuating at first, and less so latterly. It was observed as often as twice a week when meridian observations were going on, by applying a spirit-level to the telescope, and taking three pairs of reversed readings. To the level-error, as thus found, a very sensible correction for inequality of the pivots had to be applied, in the value of which I found I agreed closely with my predecessor. When the illuminated pivot was East, it was necessary to add to the level-error the correction + 2′,06 for pivot inequality. This was previous to the alteration of the Ys. On substituting the new Ys, it was found that the inequality of the parts of the pivots then brought into use was as nearly as possible half what it had been before,

and 1″, 0 was thenceforth taken as the correction. The correction for level-error was applied to each star in the usual manner by the help of a small table of factors and the slide-rule.

The azimuth error was also too unsteady to be taken as constant for any considerable time, and it was my practice to obtain a fresh determination when possible on every night of observation, either from observation of α or λ Ursæ Minoris combined with a low star, or of the two stars δ Ursæ Minoris and 51 Cephei observed one above and the other below the Pole. By this precaution, as was pointed out in the Preface to the former volume, little error can be left remaining, for provided that the level-error be sensibly steady during the working hours of one night, any error of slight amount in its assumed value is corrected out by using a false azimuth-error of the right amount. This is a point to be remembered by those who have to use an unsteady instrument.

The clock-error was found from the stars of the Nautical Almanac, after application of the small corrections to each in current use at the Royal Observatory. The clock had generally a small losing rate.

The corrections to be applied to stars' apparent positions to reduce them to their mean positions at the beginning of each year, were computed by the first set of formulæ given in the Nautical Almanac, using the Logs A, B, C, D of that work, in printed forms prepared for the purpose. In the case of stars occurring in the B. A. C. the constant Logs. *a*, *b*, *c*, *d*, were naturally used, printed forms being prepared for this case also.

OF THE CIRCLE OBSERVATIONS.

There being no clamp to the instrument, the telescope was retained in its position between the bisection of the object and the reading of the circle by its friction alone. It was never perceived to move from the position it was placed in. The object was commonly bisected when near the meridian wire by the moveable horizontal wire, a correction being afterwards applied for the screw reading. For a star distant from the equator, a correction for the curvature of its path was allowed for when sensible, if the bisections were not made at the central wire. A small table was computed for the purpose, by the usual formula

$$\text{sin. } n'' = \text{sin. } 2\,\delta.\ \text{sin.}^2\,\tfrac{1}{2}.\ t.$$

The hourly motion of a planet was allowed for when required. As no observations of the Moon in N.P.D. have been retained for publication, it is needless to give the formula special to its case.

The refraction was computed by Bessel's tables, as used at the Royal Observatory, and given in the Appendix to the Greenwich Observations for 1836. The internal temperature was assumed equal to the external. The barometer used was originally a French one, made by Herrmann, of Paris, but, before I came to use it, it had been broken, and repaired by Mr. Adie, of Edinburgh, by whom it was re-divided into English inches and decimal parts. I carefully ascertained its indication-error relatively to the flint-glass standard of the Royal Society, by means of comparisons made with two portable barometers during a journey to London in the early part of the year 1850, and found that its readings required to be increased by $0^{in.}$, 020; but this quantity, though always taken account of in the Meteorological Journal, was neglected in the calculation of refraction.

The zero of circle-reading was always found to be too unsteady to admit of my observing absolute zenith distances, and applying to them the colatitude. It was found far preferable to adopt the following process and order of reduction. When the corrected circle-readings were made out, after allowing for the reading of the micrometer-screw, for runs, and for curvature when sensible, an approximate zenith distance was found with sufficient accuracy for the calculation of refraction, and the correction for refraction was next applied. The apparent N.P.D. of the object was thence found by subtracting this circle-reading from an adopted circle-reading of the Polar point found from as many of the Nautical Almanac stars as had been observed on the same night, and were suitably situated for the purpose. No corrections in N.P.D. were applied to these Nautical Almanac stars. Observations by reflection were not systematically attempted.

The corrections to be applied to the apparent N.P.D. of stars to reduce them to their mean position at the beginning of each year, were computed in each case in a manner similar to that before described for R.A.

OF THE EQUATOREAL OBSERVATIONS.

The observations taken with the Fraunhofer Equatoreal were all micrometrical, the circles being too small for any use beyond that of setting by.

The state of adjustment of the Polar axis was examined from time to time, and was never recorded to deviate from the pole so much as 10′; it was commonly from 2′ to 5′ in error. The circles being so small, and the mounting so weak, I always had recourse to the method of observing the increments of N.P.D. of the same star at three hour-angles separated widely in time,

leaving the telescope clamped the meanwhile in N.P.D. This adjustment was commonly examined on some night when the weather was too unfavourable for other work. If θ be the star's hour-angle, positive when to the West, x and y the South and West errors of the instrumental pole, a correction $x.\cos.\theta + y.\sin.\theta$ is required to be added to the observed N.P.D. When the same star has been observed at three hour-angles, and the increments due to refraction have been deducted, the increments of observed N.P.D. at the second and third hour-angle over the first and second respectively afford two equations of condition from which the errors x and y may plainly be found. This method is one which I always found very simple and convenient in practice.

The value of one revolution of the screw of the wire-micrometer was examined by me on many occasions. Results obtained by taking transits of Polaris or γ Draconis over the two micrometer-wires set a determinate distance, such as 20 revolutions, apart, and turned into the direction of a meridian, gave no satisfaction: they always appeared to be vitiated in the same direction, giving too large a value, by the telescope's shifting when the eye-glass was moved from being opposite the first wire to the position it was necessary to place it in for the second wire. Deceived by this circumstance, I was for some time led to use too large a value, 1 revolution = 20″,06, till the observations themselves pointed out this error; when, from the measures giving the large value having been taken in the winter, I was led to conclude that temperature sensibly affected the value, and, by a comparison of all the results then accumulated, adopted the expression

$$1 \text{ revolution} = 20'',000 - 0'',0020\ (t^\circ - 45^\circ\ F.)$$

This value, however, had also to give way before further examination, and having finally concluded that the value of 1 revolution rarely exceeded the limits 20″,00 and 20″,01, I have in this re-publication of the observations replaced all results depending on assumed values different from these by others deduced from the assumed constant value 20″,00. The way in which this value was found was the following, and it always led to very consistent and apparently correct results. From my working maps, I would pick out two known stars lying nearly north and south of each other at a distance of from 1°. 30′ to 2°. 0′ apart, having a sufficient number of intermediate stars which I could use as stepping-stones from one to the other, without separating the wires of the micrometer by too great a number of revolutions at once. In this way the stars Weisse II, 27, and 104, with four intermediate stars, gave 20″,005 on the 16th of October, 1851, the number of revolutions measured through being 219,46, and the effect of refraction being properly corrected for. Other examples might be given.

The screw of the bar-micrometer was compared with that of the wire micrometer by measuring with each in succession the same terrestrial object: there appeared to be no perceptible difference between them, and in the few cases in which this micrometer was used the value of 1 revolution of its screw has also been taken as 20″,00.

The diameter of the ring-micrometer was deduced by observing diametral immersions and emersions of small stars: the assumed value of the radius 444″ is probably within half a second of the truth. It was very rarely used.

The wires of the wire-micrometer have been stated to be carried by antagonistic screws. The equality of the threads of these was inferred from the fact of the coincidence reading of the wires remaining the same at all parts of the field. The difference of N.P.D. of two objects was found by adding together the two screw-readings, and subtracting the sum of the readings for coincidence, the number of whole revolutions being taken from an index-plate.

It was my practice to examine the setting of the wire-frame for every object observed by releasing the clamp of the position-circle, and ascertaining, by trial, the reading at which a star, near the object to be observed, ran along the central wire of the five fixed wires, and then to turn the frame round and fix it at 90° from this reading.

The difference both in R.A. and N.P.D. was generally observed at the same passage through the field, the object being bisected as nearly as possible to the central wire; but there were cases, where the difference of R.A. was very small, in which the observations were made separately.

The results were corrected for refraction by the formulæ given by Bessel on page 168 of the first volume of his *Astron. Untersuchungen;* a slight modification being, however, introduced (in which I followed Professor Challis) in the way in which the factors dependent on the barometer and thermometer were included.

The correction for parallax was computed by the formulæ

$$\text{par. in R.A.} = \text{P.}\frac{1}{15}.\ \rho.\ \text{sin. Z Q. cosec. N.P.D.}$$

$$\text{par. in N.P.D.} = \text{P.}\ \rho.\ \text{cos. Z Q. sin. (N.P.D.} - \text{P Q).}$$

in which P is the equat. hor. parallax in seconds of arc, ρ the distance of the place of observation from the earth's centre expressed as a fraction of its equatoreal radius, and in which Z Q and P Q are two tabulated auxiliary angles, Z Q being a perpendicular let fall on the side P S of the triangle P Z S connecting the Pole, the Zenith, and the Object.

OF THE PRINTED RESULTS.

It was not thought necessary to print the separate results for the stars whose mean places are given in the first section.

In cases where a star is quoted as W. 1. 420, for instance, it is to be read Weisse's Catalogue, hour 1, number 420. The reference numbers of the stars of Lalande's Catalogue are taken from Mr. Bailey's edition, published by the British Association.

The reductions of the occultations of fixed stars were performed in printed forms, which were very kindly supplied by Professor Challis, with the constants adapted to Durham, at a time when he was having a supply of new forms printed for the Cambridge Observatory. The calculations were in each case very carefully checked stage by stage, and may be accepted with confidence.

In the section "Concluded Catalogue of Comparison Stars," I have been compelled to omit the catalogue names of the stars from want of space on the page, as it was necessary to give the precessions employed. These have been computed from Bessel's constants, as given in the Preface to the British Association Catalogue.

The concluding section of Equatoreal Observations is, of course, that to which I would chiefly direct attention, in the hope that the results which are there given in as correct a form as my means permitted, may be found of value to the computer in discussing the orbits of the bodies to which they relate. It has not been possible to send them to press earlier from the circumstance of the last observations of stars from Edinburgh not having come in before Nov^{r} 28, 1854.

The original observations of all kinds were entered in small memorandum books of metallic paper, on which marks made by a hard pencil are not easily effaced. These are preserved at Durham. Reductions were in all cases checked.

During the last eight or nine months of my residence at Durham, I had the assistance of Mr. G. H. Simmonds, to whom I entrusted the Meteorological observations and reductions and some of the simpler Astronomical reductions as he became equal to them. His expenses were shared between the Observatory fund and myself.

R. C. CARRINGTON.

Redhill Observatory, Jan. 3, 1855.

OBSERVATORY, DURHAM.

CONCLUDED CATALOGUE

OF MEAN R.A. AND N.P.D. OF STARS

OBSERVED WITH THE DURHAM TRANSIT CIRCLE,

IN THE YEARS 1849, 1850, AND 1851.

IN TWO PARTS:

THE FIRST REDUCED TO JAN. 1, 1850,

THE SECOND REDUCED TO JAN. 1, 1851.

MEAN PLACES OF STARS.—FIRST PART.

Reference No.	No. in B.A.C.	Obs. in R.A.	Mean R.A., 1850.	Obs. in N.P.D.	Mean N.P.D. 1850.	NOTES.
			h. m. s.		° ′ ″	
1	95	1	0. 18. 56, 07	1	90. 52. 50, 0	
2	482	2	1. 28. 21, 57	1	32. 47. 20, 9	
3	547	6	1. 39. 58, 30	5	42. 51. 10, 6	
4	565	1	1. 44. 3, 40	0	101. 5.	
5	845	1	2. 36. 50, 42	0	80. 31.	
6	986	1	3. 3. 3, 58	1	70. 50. 38, 3	
7	1099	1	3. 25. 51, 18	1	42. 18. 42, 2	
8	1174	1	3. 40. 3, 04	0	79. 19.	
9	1176	1	3. 40. 15, 24	1	66. 24. 33, 1	
10	1241	2	3. 52. 22, 52	0	77. 56.	Argel : Z. 166. 27.
11		8	3. 54. 38, 87	8	28. 4. 43, 4	*n.p.* of two.
12	1257	1	3. 55. 50, 17	0	68. 20.	
13	1286	1	4. 3. 42, 53	0	28. 32.	
14	1328	2	4. 11. 15, 71	2	74. 44. 20, 0	
15	1369	1	4. 17. 48, 28	0	74. 44.	
16		1	4. 19. 3, 48	1	74. 45. 5, 0	Lalande 8362.
17	1381	1	4. 20. 6, 20	1	74. 28. 1, 0	
18	1390	1	4. 21. 35, 69	1	74. 41. 38, 5	
19	1392	1	4. 22. 5, 65	0	74. 38.	
20	1501	1	4. 44. 28, 08	1	34. 25. 25, 1	
21	1516	1	4. 46. 38, 64	1	80. 5. 31, 7	
22	1518	1	4. 47. 7, 76	1	65. 39. 9, 2	
23	1551	3	4. 54. 8, 03	1	68. 37. 44, 8	
24	1567	1	4. 58. 2, 87	1	36. 29. 31, 9	
25	1656	4	5. 13. 33, 73	2	81. 43. 25, 9	
26	1723	1	5. 22. 58, 20	1	57. 55. 28, 2	
27	1727	1	5. 23. 29, 25	1	57. 49. 28, 5	
28	1752	1	5. 27. 42, 95	1	96. 6. 24, 9	
29	1767	1	5. 28. 41, 04	1	68. 57. 15, 7	
30	1784	0	5. 31.	1	35. 12. 56, 8	
31	1824	1	5. 38. 26, 04	1	50. 31. 30, 0	
32	1826	8	5. 38. 38, 14	6	80. 32. 16, 4	
33	1864	1	5. 44. 7, 61	1	97. 33. 45, 3	
34	1888	1	5. 47. 25, 60	1	35. 28. 31, 4	
35	1921	1	5. 52. 2, 96	1	46. 37. 47, 9	
36	1936	1	5. 54. 47, 16	1	100. 36. 15, 3	
37	1950	1	5. 57. 39, 17	1	29. 31. 48, 2	
38	1971	1	6. 0. 37, 65	1	66. 52. 3, 6	
39	1981	1	6. 2. 20, 33	1	65. 33. 6, 5	
40	1994	2	6. 4. 33, 97	2	96. 31. 12, 7	
41	2002	1	6. 5. 49, 33	0	67. 27.	
42	2022	1	6. 8. 50, 59	1	80. 0. 27, 5	
43		2	6. 16. 1, 05	1	76. 51. 42, 5	
44		1	6. 18. 11, 67	0	76. 49.	
45	2101	1	6. 21. 18, 19	1	67. 21. 38, 5	
46	2163	1	6. 29. 2, 81	1	73. 28. 37, 6	
47	2184	3	6. 32. 42, 70	3	73. 28. 3, 6	
48	2291	1	6. 52. 27, 24	1	115. 12. 48, 6	N.P.D. doubtful.
49	2292	1	6. 52. 40, 89	1	79. 10. 8, 5	
50	2305	1	6. 55. 12, 60	1	69. 12. 52, 5	

MEAN PLACES OF STARS.—FIRST PART.

Reference No.	No. in B.A.C.	Obs. in R.A.	Mean R.A. 1850.	Obs. in N.P.D.	Mean N.P.D. 1850.	NOTES.
			h. m. s.		° ′ ″	
51	2329	2	6. 59. 37, 60	2	74. 14. 23, 3	
52	2379	1	7. 7. 7, 27	1	40. 16. 29, 4	
53		3	7. 17. 9, 04	3	43. 10. 52, 1	
54	2463	1	7. 19. 20, 60	1	62. 8. 54, 7	
55		1	7. 23. 14, 60	1	43. 31. 54, 1	
56	2488	8	7. 25. 37, 36	7	43. 29. 43, 0	
57		1	7. 29. 41, 75	1	104. 9. 9, 2	*n.p.* of two.
58	2551	1	7. 35. 23, 02	1	65. 14. 50, 7	
59	2586	1	7. 40. 39, 00	1	61. 25. 50, 1	
60		2	7. 43. 15, 60	2	50. 8. 9, 4	
61	2617	1	7. 44. 18, 59	1	62. 51. 3, 1	
62		2	7. 53. 33, 20	2	52. 26. 58, 1	
63	2707	1	7. 57. 48, 95	1	21. 5. 33, 8	
64	2715	1	7. 59. 4, 13	1	47. 8. 8, 8	
65	2748	1	8. 3. 58, 29	1	75. 33. 10, 3	
66	2761	1	8. 6. 0, 36	1	76. 30. 4, 3	
67	2824	2	8. 17. 57, 83	2	20. 11. 3, 0	
68		1	8. 23. 45, 17	1	79. 40. 57, 9	
69	2867	1	8. 24. 29, 78	1	79 25. 46, 4	
70	2882	1	8. 26. 54, 75	1	29. 32. 31, 2	
71	3004	3	8. 43. 44, 70	3	23. 54. 31, 1	
72	3022	1	8. 46. 8, 43	1	75. 11. 30, 6	
73	3041	1	8. 48. 17, 72	1	71. 56. 49, 6	
74	3083	1	8. 54. 43, 48	1	38. 34. 57, 1	
75	3086	11	8. 55. 1, 34	11	30. 3. 44, 0	
76	3133	3	9. 4. 22, 66	3	85. 31. 15, 7	
77	3170	1	9. 10. 28, 43	1	63. 7. 7, 9	
78	3172	1	9. 10. 40, 09	1	32. 40. 10, 6	
79	3182	3	9. 12. 16, 67	3	39. 49. 16, 3	
80		1	9. 25. 39, 25	1	97. 50. 32, 8	Lalande 18794.
81	3286	2	9. 29. 17, 36	2	82. 29. 39, 9	
82	3310	3	9. 33. 0, 93	3	100. 5. 29, 9	
83	3325	1	9. 36. 2, 98	1	26. 3. 29, 9	
84	3336	1	9. 38. 15, 02	1	82. 36. 7, 3	
85	3375	4	9. 44. 39, 50	4	54. 18. 48, 0	
86	3380	3	9. 45. 50, 20	3	83. 20. 15, 0	
87	3397	1	9. 48. 27, 70	1	43. 52. 28, 6	
88	3402	1	9. 49. 29, 89	1	32. 28. 28, 5	
89	3415	2	9. 52. 16, 88	1	81. 14. 20, 7	
90	3418	1	9. 53. 3, 65	1	80. 20. 44, 5	N.P.D. doubtful.
91	3420	2	9. 53. 21, 26	2	57. 44. 49, 0	
92	3427	1	9. 55. 13, 33	1	56. 37. 51, 0	
93	3430	1	9. 55. 20, 19	1	81. 2. 50, 4	
94	3431	1	9. 55. 30, 82	1	56. 49. 25, 8	
95	3438	1	9. 56. 57, 27	1	84. 16. 13, 4	
96	3486	2	10. 6. 16, 73	2	96. 38. 37, 2	
97	3528	0	10. 12, 3	2	6. 40. 58, 8	
98	3529	2	10. 12. 41, 13	2	82. 49. 0, 6	
99	3553	2	10. 15. 56, 75	2	92. 53. 9, 8	
100	3570	1	10. 18. 57, 50	1	90. 13. 36, 6	

MEAN PLACES OF STARS.—FIRST PART.

Reference No.	No. in B.A.C.	Obs. in R.A.	Mean R.A. 1850.	Obs. in N.P.D.	Mean N.P.D. 1850.	NOTES.
			h. m. s.		° ′ ″	
101	3582	1	10. 21. 7, 80	1	92. 58. 37, 5	
102	3592	1	10. 22. 0, 29	1	87. 44. 15, 5	
103	3608	3	10. 24. 30, 82	3	84. 35. 10, 3	
104	3627	2	10. 27. 49, 68	2	112. 24. 13, 5	
105	3634	1	10. 29. 43, 04	1	71. 56. 36, 8	
106	3637	1	10. 30. 8, 89	1	102. 36. 20, 6	
107	3645	1	10. 31. 3, 54	1	20. 46. 34, 4	
108	3652	1	10. 32. 14, 60	1	20. 8. 28, 3	
109	3684	4	10. 37. 25, 69	4	86. 43. 27, 8	
110	3726	3	10. 44. 31, 25	3	88. 10. 47, 4	
111	3732	3	10. 46. 5, 50	3	91. 20. 0, 2	
112	3780	5	10. 55. 53, 26	5	81. 36. 36, 3	
113	3788	1	10. 57. 16, 69	0	81. 51.	
114	3821	7	11. 2. 32, 10	7	20. 54. 55, 1	
115	3862	1	11. 13. 23, 79	0	83. 9.	
116	3869	2	11. 14. 37, 56	2	71. 44. 28, 1	
117	3900	1	11. 20. 13, 57	1	86. 19. 6, 2	
118	3925	1	11. 25. 10, 20	1	97. 0. 1, 6	
119	4005	2	11. 43. 13, 25	2	76. 53. 16, 9	
120	4018	1	11. 46. 2, 17	1	48. 15. 13, 2	
121	4052	1	11. 53. 11, 13	1	82. 32. 56, 2	
122	4072	2	11. 57. 34. 04	2	80. 26. 1, 2	
123		1	12. 2. 37, 89	0	11. 50. ±	
124	4101	1	12. 3. 20, 76	1	112. 45. 56, 2	
125	4111	1	12. 4. 41, 00	2	11. 43. 30, 7	
126	4145	2	12. 12. 14, 12	2	89. 49. 58, 0	
127	4153	1	12. 12. 47, 11	1	62. 32. 34, 1	
128	4199	1	12. 20. 7, 98	1	63. 15. 25, 5	
129	4205	2	12. 21. 8, 20	2	62. 56. 30, 8	
130	4207	1	12. 21. 24, 90	1	63. 15. 24, 6	
131	4268	1	12. 34. 3, 72	1	90. 37. 28, 1	
132	4277	1	12. 35. 56, 08	1	90. 45. 6, 9	
133	4305	1	12. 42. 6, 66	1	28. 51. 39, 7	
134	4340	1	12. 48. 3, 05	1	85. 47. 11, 6	
135	4346	1	12. 49. 0, 32	1	50. 52. 14, 2	
136		3	13. 0. 23, 20	3	85. 56. 27, 0	Lalande 24388.
137	4401	2	13. 2. 11, 33	1	94. 44. 13, 5	
138		4	13. 4. 45, 15	4	86. 32. 52, 7	Lalande 24513.
139	4568	1	13. 35. 2, 58	1	34. 33. 27, 6	
140	4575	1	13. 36. 39, 90	1	66. 32. 30, 2	
141	4610	1	13. 41. 52, 52	1	58. 3. 47, 3	
142	4678	1	13. 55. 54, 25	1	57. 36. 54, 7	
143	4682	1	13. 57. 4, 10	1	105. 36. 53, 9	R.A. bad.
144	7759	3	22. 7. 4, 44	1	29. 58. 49, 6	
145	7773	1	22. 8. 54, 89	0	98. 32.	
146	8085	2	23. 6. 33, 11	1	96. 51. 23, 2	
147	8116	1	23. 11. 9, 35	0	100. 26.	
148		1	23. 23. 18, 72	1	81. 20. 32, 6	
149		1	23. 24. 35, 15	1	83. 44. 25, 3	
150	8328	1	23. 50. 59, 55	0	94. 23.	

MEAN PLACES OF STARS.—SECOND PART.

Reference No.	Name.	Obs. in R.A.	Mean R.A. 1851.	Obs. in N.P.D.	Mean N.P.D. 1851.
			h. m. s.		° ′ ″
151	W. 1. 420.	1	1. 24. 32, 48	0	87. 5. . . . .
152	—— 431.	2	1. 25. 3, 08	0	87. 44. . . . .
153	—— 508.	1	1. 29. 34, 54	0	88. 10. . . . .
154	—— 511.	3	1. 30. 38, 82	0	88. 10. . . . .
155	—— 562.	1	1. 32. 1, 60	0	87. 18. . . . .
156	—— 620.	3	1. 34. 11, 72	0	88. 3. . . . .
157	—— 675.	2	1. 36. 38, 92	0	88. 8. . . . .
158	—— 686.	2	1. 37. 23, 65	0	88. 15. . . . .
159	—— 752.	2	1. 42. 6, 18	0	87. 43. . . . .
160	Anon. 9th Mag.	1	1. 43. 10, 06	0	87. 40. ±
161	B.A.C. 574.	1	1. 45. 50, 66	0	87. 33. . . . .
162	W. 1. 847.	3	1. 47. 4, 52	0	87. 20. . . . .
163	Anon. 9th Mag.	1	1. 47. 30, 82	0	87. 15. ±
164	W. 1. 962.	3	1. 53. 55, 35	0	87. 2. . . . .
165	W. 2. 72.	1	2. 5. 29, 71	0	85. 57. . . . .
166	B.A.C. 687.	4	2. 5. 42, 48	0	85. 41. . . . .
167	W. 2. 158.	3	2. 10. 48, 40	0	82. 31. . . . .
168	—— 213.	3	2. 13. 39, 30	0	82. 56. . . . .
169	Anon. 8th Mag.	3	2. 18. 25, 45	0	84. 23. . . . .
170	W. 2. 312.	3	2. 19. 13, 64	0	84. 27. . . . .
171	B.A.C. 760.	1	2. 20. 14, 62	0	82. 13. . . . .
172	W. 2. 347.	2	2. 21. 5, 13	0	82. 17. . . . .
173	—— 417.	3	2. 25. 5, 00	0	82. 46. . . . .
174	B.A.C. 789.	1	2. 27. 11, 05	0	83. 11. . . . .
175	—— 793.	3	2. 27. 55, 05	0	83. 50. . . . .
176		1	8. 54. 1, 21	1	64. 57. 50, 5
177		1	9. 4. 53, 57	1	65. 5. 48, 2
178	Lalande 18184.	3	9. 5. 46, 60	3	64. 22. 27, 9
179	—— 18259.	3	9. 8. 5, 83	3	64. 44. 40, 4
180		1	9. 15. 43, 66	1	65. 47. 4, 8
181		4	9. 16. 36, 45	4	64. 37. 39, 6
182		3	9. 21. 30, 35	3	64. 40. 15, 8
183	Anon. 6th Mag.	1	9. 25. 28, 22	0	66. 0. ±
184		3	9. 29. 2, 60	3	64. 56. 11, 9
185		2	9. 29. 24, 70	2	65. 15. 59, 4
186	B.A.C. 3327.	2	9. 36. 47, 17	2	65. 50. 32, 8
187	Lalande 19329.	5	9. 44. 27, 84	5	66. 40. 56, 1
188	—— 19522.	4	9. 51. 9, 92	4	67. 58. 10, 0
189	B.A.C. 3423.	1	9. 54. 30, 00	1	67. 20. 1, 9
190	Lalande 19677.	3	9. 56. 55, 60	2	69. 21. 50, 7
191		4	10. 0. 3, 24	2	70. 30. 30, 5
192	B.A.C. 3460.	2	10. 0. 57, 40	2	70. 44. 21, 4
193	Lalande 19900.	1	10. 6. 58, 83	1	70. 8. 16, 8
194	γ' Leonis.	4	10. 11. 45, 05	4	69. 24. 25, 4
195	W. 15. 1118.	1	15. 58. 45, 20	0	103. 44. . . . .

OBSERVATORY, DURHAM.

APPARENT R.A. AND N.P.D. OF PLANETS,

OBSERVED WITH THE DURHAM TRANSIT CIRCLE,

AND COMPARED WITH THEIR COMPUTED POSITIONS,

AS GIVEN IN THE NAUTICAL ALMANAC.

APPARENT PLACES OF PLANETS.

Mars and β Tauri.

1849.	Wires.	R.A.	Exc.	Limb.	N.P.D.	Par. applied.	Exc.
		h. m. s.	s.		° ′ ″	″	″
Nov. 23	..	.. ..			.. ..		
—	7	6. 19. 47, 51	—1, 68	Cen.	64. 35. 54, 0	6, 81	—21, 4
Nov. 30	..	.. ..			.. ..		
—	7	6. 11. 45, 06	—1, 67	..	.. ..	..	..
Dec. 3	..	.. ..			.. ..		
—	7	6. 7. 31, 88	—1, 93	..	.. ..	..	..
Dec. 4	7	5. 16. 49, 33			61. 31. 38, 3		
—	5	6. 6. 1, 98	—1, 82	S	63. 59. 59, 0	6, 97	—18, 7
Dec. 19	..	.. ..			.. ..		
—	7	5. 40. 36, 72	—1, 84	N	63. 30. 54, 9		—18, 3
Dec. 22	7	5. 16. 49, 35			61. 37. 37, 2		
—	7	5. 35. 29, 66	—1, 80	S	63. 29. 7, 5	6, 86	—16, 4
1850.							
Jan. 7	7	5. 13. 43, 51	—1, 57	N	63. 36. 52, 3	6, 24	—14, 0
—	3	5. 16. 49, 53			61. 31. 36, 1		
Jan. 8	5	5. 12. 47, 66	—1, 57	S	63. 37. 57, 3	6, 20	—16, 9
—	7	5. 16. 49, 55			61. 31. 35, 1		
Jan. 17	7	5. 7. 7, 00	—1, 37	..	.. ..	..	..
—	6	5. 16. 49, 53			.. ..		
Jan. 23	7	5. 6. 2, 59	—1, 37	..	.. ..	..	..
—	7	5. 16. 49, 52			.. ..		
Jan. 24	7	5. 6. 4, 00	—1, 38	S	63. 53. 10, 9	5, 36	—14, 8
—	..	.. ..			.. ..		
Jan. 26	7	5. 6. 16, 82	—1, 43	S	63. 54. 27, 4	5, 30	—14, 4
—	7	5. 16. 49, 48			61. 31. 32, 2		
Jan. 28	7	5. 6. 42, 42	—1, 31	S	63. 55. 34, 8	5, 20	—15, 7
—	6	5. 16. 49, 39			61. 31. 35, 3		
Jan. 29	7	5. 6. 59, 97	—1, 29	N	63. 56. 1, 3	5, 20	—13, 3
—	7	5. 16. 49, 45			61. 31. 35, 9		
Feb. 7	7	5. 10. 49, 88	—1, 16	N	63. 58. 33, 1	4, 70	—11, 8
—	7	5. 16. 49, 36			61. 31. 34, 7		
Feb. 9	7	5. 13. 24, 35	—1, 13	N	63. 58. 44, 4		—11, 1
—	..	.. ..			.. ..		

Dec. 19.—Just emerged from a cloud. Jan. 7.—Seen through cloud. Jan. 17.—Foggy; small. Jan. 23.—Ill-defined.

APPARENT PLACES OF PLANETS.

Mars and β Tauri.

1850.	Wires.	R.A.	Exc.	Limb.	N.P.D.	Par. applied.	Exc.
	..	.. .. ..			.. .. ..		
		h. m. s.	s.		° ′ ″		″
Feb. 13							
—	7	5. 17. 2, 84	—0, 82	S	63. 58. 56, 4		—15, 1
Feb. 16	7	5. 16. 49, 18			.. ..	″	
—	7	5. 20. 11, 61	—1, 03	S	63. 58. 53, 2	4, 3	—15, 3
Feb. 18	7	5. 16. 49, 20			61. 31. 35, 2		
—	7	5. 22. 28, 07	—0, 90	S	63. 58. 47, 1	4, 2	—13, 5
Feb. 20	7	5. 16. 48, 99			61. 31. 35, 4		
—	7	5. 24. 52, 74	—0, 77	N	63. 58. 39, 7	4, 1	—10, 2
Feb. 22	7	5. 16. 49, 21			61. 31. 34, 3		
—	7	5. 27. 25, 59	—1, 03	S	63. 58. 41, 7	4, 0	—14, 6
Feb. 25	7	5. 16. 49, 09			61. 31. 34, 3		
—	7	5. 31. 28, 14	—0, 93	S	63. 58. 43, 5	3, 9	—13, 1
March 8		.. ..			.. ..		
—	7	5. 48. 21, 70	—0, 88	S	64. 1. 13, 3	3, 5	(—5, 6)

Feb. 13 and March 8.—Foggy; small. Feb. 18.—Hazy; much motion. No correction for defect of illumination has been applied.

Jupiter.

1850.	Wires.	R.A.	Exc.	Limb.	N.P.D.	Exc.	
		h. m. s.	s.		° ′ ″	″	
Feb. 9	7	11. 30. 33, 67	—0, 89	S	85. 14. 58, 2	— 6, 7	
11	6	29. 49, 81	0, 51	N	85. 9. 48, 7	2, 6	
21	7	25. 46, 56	0, 93	S	84. 41. 57, 6	4, 5	
22	7	25. 20, 01	0, 75	N	84. 38. 57, 7	2, 5	
March 7	7	19. 17, 41	0, 88	S	83. 59. 2, 7	3, 4	
25	7	10. 53, 92	1, 19	N	83. 5. 59, 3	4, 8	
26	7	10. 27, 69	0, 94	S	83. 3. 27, 6	(12, 6)	Foggy.
27	7	10. 2, 02	0, 91	N	83. 0. 45, 8	7, 8	
28	7	9. 36, 81	1, 00	S	82. 58. 11, 5	7, 8	
29	7	9. 11, 88	1, 00	N	55. 38, 0	5, 9	
April 5	7	6. 28, 81	0, 97	N	39. 17, 4	2, 2	Ill seen.
6	7	6. 7, 28	0, 92	S	37. 14, 6	5, 9	Ill seen.
12	7	4. 9, 18	0, 82	S	25. 48, 1	3, 7	
18	6	2. 31, 63	0, 80	N	16. 42, 7	4, 1	
22	7	1. 39, 02	0, 92	N	12. 1, 5	5, 6	
23	7	1. 27, 39	0, 88	S	11. 2, 3	6, 7	
May 2	7	11. 0. 12, 76	1, 04	N	5. 6, 7	3, 2	
6	7	10. 59. 56, 72	0, 89	S	4. 24, 9	7, 1	Small.
12	7	10. 59. 53, 28	—0, 93	S	82. 5. 20, 4	— 3, 6	

APPARENT PLACES OF PLANETS.

Saturn.

1849.	Wires.	R.A.	Exc.	Limb.	N.P.D.	Exc.	
		h. m. s.	s.		° ′ ″	″	
Nov. 13	7	0. 9. 49, 34	—1, 47	..	.. ..	..	
14	7	9. 41, 45	1, 59	..	.. ..	..	
15	7	9. 33, 52	1, 32	..	.. ..	..	
16	5	9. 26, 34	1, 44	..	.. ..	..	
28	7	8. 27, 49	1, 17	Cen.	91. 49. 53, 4	—0, 5	
30	7	8. 23, 15	1, 23	..	.. ..	..	
Dec. 3	7	8. 19, 50	1, 24	..	.. ..	..	
6	7	8. 19, 54	1, 40	N	91. 48. 43, 4	—0, 9	Ill seen.
16	5	8. 44, 89	1, 30	..	.. ..	..	
17	7	8. 49, 56	1, 25	s	91. 42. 35, 6	—2, 9	N.P.D. too grt.
19	7	9. 0, 32	1, 37	..	.. ..	..	
20	7	0. 9. 6, 17	—1, 31	..	.. ..	..	

Uranus.

1849.	Wires.	R.A.	Exc.		N.P.D.	Exc.	
		h. m. s.	s.		° ′ ″	″	
Nov. 14	7	1. 26. 44, 39	+10, 12		.. ..	..	
23	7	25. 40, 20	9, 85		81. 38. 44, 8	—51, 8	
28	6	25. 8, 67	10, 13		41. 45, 1	55, 9	
30	7	24. 57, 23	10, 10		.. ..	..	
Dec. 17	7	23. 46, 00	10, 02		49. 12, 6	51, 1	
19	7	23. 41, 12	9, 87		49. 37, 8	50, 8	
1850.							
Jan. 5	7	23. 29, 15	9, 81		.. ..	..	
7	7	1. 23. 31, 58	+ 9, 65		81. 49. 54, 2	—53, 1	

Neptune.

1849.	Wires.	R.A.	Exc.		N.P.D.	Exc.	
		h. m. s.	s.		° ′ ″	″	
Nov. 13	5	22. 17. 9, 93	—0, 10		.. ..	..	
14	5	10, 08	—0, 16		.. ..	..	
15	7	10, 09	+0, 04		.. ..	..	
Dec. 3	7	36, 17	+0, 14		.. ..	..	
6	5	17. 44, 49	+0, 24		101. 22. 28, 0	—0, 7	
17	6	22. 18. 24, 75	+0, 39		101. 18. 24, 5	+6, 8	

NOTE.—For Mars, Jupiter, Saturn, and Uranus, the parallax applied, and the computed positions have been taken from the Nautical Almanac.
For Neptune they have been taken from the Ephemeris of Sears C. Walker.

OBSERVATORY, DURHAM.

APPARENT R. A.

OF THE MOON AND MOON-CULMINATING STARS,

OBSERVED WITH THE DURHAM TRANSIT CIRCLE,

AND COMPARED WITH CORRESPONDING OBSERVATIONS,

TAKEN AT THE ROYAL OBSERVATORY, AT GREENWICH.

LONGITUDE OF DURHAM OBSERVATORY, THENCE DEDUCED.

MOON AND MOON-CULMINATORS.

1849.	Name.	Durham Transit.	Greenwich.	Diff.	Corr.
		h. m. s.	s.	s.	s.
	20 Piscium	23. 40.....	13, 60	..	
	27 Piscium	23. 50.....	59, 36	..	
Oct. 28	Moon. I. L.	23. 58. 20, 48	6, 82		..
	δ Piscium	.. ..	..	..	
	20 Ceti	.. ..	..	..	
	φ Aquarii	23. 6. 32, 25	32, 38	+, 03	
	ψ^3 Aquarii	23. 11. 8, 53	8, 65	+, 12	
Nov. 24	Moon. I. L.	23. 33. 50, 47	37, 07		+, 08
	27 Piscium	23. 50. 59, 01	59, 12	+, 11	
	33 Piscium	23. 57. 38, 91	38, 95	+, 04	
	B.A.C. 845	2. 36. 50, 67	..	..	
	δ Arietis	3. 3. 3, 96	..	..	
Nov. 28	Moon. I. L.	3. 14. 24, 19	..		..
	ε Tauri	3. 40. 3, 39	..	..	
	λ Tauri	3. 52. 22, 91	..	..	
	α Tauri	4. 27. 19, 50	..	(+, 11)	
	ι Tauri	4. 54. 8, 47	.	(+, 07)	
Nov. 30	Moon. II. L.	5. 25. 12, 94	55, 46		+, 15
	η Geminorum	6. 5. 49, 56	49, 84	+, 28	
	μ Geminorum	.. ..	..	..	
	ν Aquarii	.. ..	..	..	
	ι Capricorni	.. ..	..	..	
Dec. 19	Moon. I. L.	21. 34. 52, 29	..		..
	ι Aquarii	.. ..	..	..	
	θ Aquarii	22. 9. 53, 44	..	..	
	λ Tauri	3. 52. 22, 76	..	(+, 01)	
1850.	A′ Tauri	3. 55. 50, 53	..	(—, 13)	
Jan. 23	Moon. I. L.	4. 15. 2, 62	47, 01		+, 02
	α Tauri	4. 27. 19, 52	19, 61	+, 09	
	ι Tauri	4. 54. 8, 58	8, 68	+, 10	
	α Tauri	.. ..	..	..	
	ι Tauri	4. 54. 8, 64	..	..	
Jan. 24	Moon. I. L.	5. 17. 50, 27	..		..
	ζ Tauri	5. 28. 41, 74	..	..	
	μ Geminorum	6. 13. 53, 96	..	..	
	ζ Geminorum	6. 55. 13, 49	..	(—, 04)	
	δ Geminorum	7. 11. 10, 88	..	..	
Jan. 26	Moon. I. L.	7. 30. 25, 95	8, 46		—, 02
	β Geminorum	7. 36. 8, 78	8, 72	—, 06	
	φ Geminorum	7. 44. 19, 55	..	(+, 01)	

MOON AND MOON-CULMINATORS.

1850.	Name.	Durham Transit.	Greenwich.	Diff.	Corr.
		h. m. s.	s.	s.	s.
	ξ Leonis	.. ..	..	..	
	o Leonis	.. ..	..	..	
Jan. 28	Moon. II. L.	9. 42. 42, 08	..		..
	π Leonis	9. 52. 17, 65	..	..	
	α Leonis	10. 0. 23, 46	..	..	
	ε Tauri	.. ..	..	..	
	α Tauri	4. 27. 19, 02	..	..	
Feb. 20	Moon. I. L.	4. 52. 37, 88	..		..
	β Tauri	5. 16. 48, 99	..	..	
	ζ Tauri	.. ..	..	..	
	μ Geminorum	6. 13. 53, 72	53, 70	—, 02	
	γ Geminorum	6. 29. 3, 40	3, 33	—, 07	
Feb. 22	Moon. I. L.	6. 58. 54, 29	37, 29		—, 03
	δ Geminorum	7. 11. 10, 52	10, 38	—, 14	
	κ Geminorum	7. 35. 23, 87	23, 99	+, 12	
	π Leonis	9. 52. 17, 92	17, 98	+, 06	
	α Leonis	10. 0. 23, 66	23, 74	+, 08	
Mar. 25	Moon. I. L.	10. 40. 42, 67	27, 50		—, 02
	σ Leonis	11. 13. ..	25, 21	..	
	τ Leonis	11. 20. 14, 77	14, 58	—, 19	
	σ Leonis	11. 13. 24, 96	..	(+, 23)	
	τ Leonis	.. ..	..	..	
Mar. 26	Moon. I. L.	11. 37. 12, 60	58, 02		+, 01
	π Virginis	11. 53. 12, 35	..	(+, 02)	
	η Virginis	12. 12. 15, 32	..	(—, 11)	
	π Virginis	.. ..	..	..	
	η Virginis	12. 12. 15, 48	15, 26	—, 22	
Mar. 27	Moon. II. L.	12. 34. 10, 05	56, 00		—, 12
	θ Virginis	13. 2. 12, 69	..	(—, 13)	
	α Virginis	13. 17. 19, 18	..	(—, 02)	
	θ Virginis	13. 2. 12, 60	12, 56	—, 04	
	α Virginis	13. 17. 19, 16	19, 16	, 00	
Mar. 28	Moon. II. L.	13. 27. 38, 63	24, 71		—, 02
	κ Virginis	.. ..	..	..	
	λ Virginis	.. ..	..	..	
	β Geminorum	7. 36. 7, 73	..	..	
	φ Geminorum	.. ..	..	..	
Apr. 19	Moon. I. L.	8. 22. 38, 19	..		..
	δ Cancri	.. ..	..	..	
	α Cancri	.. ..	..	..	

MOON AND MOON-CULMINATORS.

1850.	Name.	Durham Transit.	Greenwich.	Diff.	Corr.
		h. m. s.	s.	s.	s.
	α Leonis	.. ..	..	..	
	χ Leonis	10. 57. 17, 64	17, 64	, 00	
April 22	Moon. I. L.	11. 16. 12, 90	58, 65		, 00
	β Virginis	11. 42. ..	53, 97	..	
	o Virginis	11. 57. 35, 19	..	(+, 01)	
	β Virginis	.. ..	..	..	
	o Virginis	11. 57. 35, 20	..	..	
April 23	Moon. I. L.	12. 10. 11, 66	..		..
	γ Virginis	.. ..	..	..	
	δ Virginis	12. 48. 4, 38	..	..	
	α^2 Libræ	14. 42. 37, 11	37, 01	—, 10	
	ξ^2 Libræ	14. 48. ..	39, 76	..	
June 20	Moon. I. L.	15. 3. 25, 28	11, 98		—, 06
	γ Libræ	15. 27. 10, 44	..	(—, 20)	
	η Libræ	15. 35. 40, 34	40, 39	+, 05	
	η Ophiuchi	17. 1. ..	48, 92	..	
	θ Ophiuchi	17. 12. 50, 20	..	(+, 31)	
June 23	Moon. I. L.	17. 39. 12, 82	58, 99		+, 15
	4 Sagittarii	.. ..	..	..	
	μ^1 Sagittarii	18. 4. 49, 92	.	(—, 01)	
	α^2 Capricorni	.. ..	..	..	
	β Capricorni	.. ..	..	..	
June 26	Moon. II. L.	20. 18. 9, 52	..		..
	η Capricorni	20. 55. 53, 46	..	..	
	ν Aquarii	21. 1. 26, 77	..	..	
	e^2 Sagittarii	19. 33. 58, 32	..	..	
	α^2 Capricorni	.. ..	..	..	
Sept. 16	Moon. I. L.	20. 15. 18, 89	..		..
	η Capricorni	.. ..	..	..	
	ν Aquarii	.. ..	..	..	
	η Capricorni	20. 55. 54, 09	..	..	
	ν Aquarii	21. 1. 27, 61	..	..	
Sept. 17	Moon. I. L.	21. 5. 57, 00	..		..
	δ Capricorni	21. 38. 47, 85	..	..	
	μ Capricorni	21. 45. 9, 28	..	..	
	27 Piscium	.. ..	..	..	
	33 Piscium	23. 57. 41, 99	..	(+, 08)	
Sept. 21	Moon. II. L.	0. 22. 55, 05	42, 28		+, 04
	20 Ceti	0. 45. 23, 23	..	(+, 00)	
	e Piscium	.. ..	..	..	

MOON AND MOON-CULMINATORS.

1850.	Name.	Durham Transit.	Greenwich.	Diff.	Corr.
		h. m. s.	s.	s.	s.
	α^2 Capricorni	20. 9. 45, 46	..	..	
	β Capricorni	20. 12. 36, 56	..	..	
Oct. 14	Moon. I. L.	20. 46. 34, 82	21, 85		..
	ν Aquarii	21. 1. 27, 16	..	..	
	ι Capricorni	21. 13. 55, 38	..	..	
	λ Aquarii	22. 44. 49, 53	49, 67	+, 14	
	ϕ Aquarii	23. 6. 35, 49	35, 62	+, 13	
Oct. 17	Moon. I. L.	23. 13. 47, 14	34, 57		+, 04
	27 Piscium	23. 51. 2, 27	2, 22	—, 05	
	30 Piscium	23. 54. 18, 56	18, 61	+, 05	
	ϕ Aquarii	23. 6. 35, 34	35, 40	+, 06	
	ψ^3 Aquarii	23. 11. 11, 52	11, 52	, 00	
Nov. 14	Moon. I. L.	23. 41. 20, 98	8, 61		+, 03
	27 Piscium	23. 51. 2, 09	2, 07	—, 02	
	33 Piscium	23. 57. 41, 85	41, 94	+, 09	
	20 Ceti	0. 45. 23, 29	..	..	
	e Piscium	1. 0. 41, 62	..	..	
Nov. 16	Moon. I. L.	1. 19. 35, 63	..		..
	a Piscium	1. 54. 20, 50	..	..	
	ξ^1 Ceti	2. 5. 6, 48	..	..	
	27 Piscium	23. 51. 1, 66	..	..	
	33 Piscium	23. 57. 41, 53	..	..	
Dec. 12	Moon. I. L.	0. 8. 21, 79	9, 44		..
	δ Piscium	.. ..	..	..	
	20 Ceti	.. ..	..	..	
	33 Piscium	23. 57. 41, 14	41, 31	+, 17	
1851.	12 Ceti	0. 22. 25, 10	25, 01	—, 09	
Jan. 9	Moon. I. L.	0. 36. 28, 75	16, 42		+, 04
	ϵ Piscium	.. ..	..	..	
	e Piscium	1. 0. 41, 18	..	..	
	B.A.C. 845	2. 36. 53, 37	..	..	
	π Arietis	2. 40. 58, 93	..	..	
Jan. 12	Moon. I. L.	3. 4. 28, 03	..		..
	e Tauri	3. 40. 6, 38	..	..	
	λ Tauri	3. 52. 25, 86	..	..	
	ξ^2 Ceti	2. 20. 13, 83	..	..	
	ν Ceti	.. ..	..	..	
Feb. 8	Moon. I. L.	2. 43. 17, 56	4, 37		..
	o Tauri	3. 16. 47, 74	..	..	
	f Tauri	3. 22. 38, 78	..	..	

MOON AND MOON-CULMINATORS.

1851.	Name.	Durham Transit.	Greenwich.	Diff.	Corr.
		h. m. s.	s.	s.	s.
	θ Cancri	8. 23. 6, 54	..	..	
	δ Cancri	8. 36. 13, 64	13, 46	—, 18	
Feb. 14	Moon. I. L.	8. 43. 53, 98	36, 87		—, 20
	ξ Leonis	9. 23. 55, 53	55, 32	—, 21	
	o Leonis	9. 33. 12, 53	..	..	
	α Leonis	.. ..	..	..	
	ρ Leonis	10. 24. 58, 43	58, 46	+, 03	
Feb. 16	Moon. II. L.	10. 54. 48, 53	32, 48		—, 11
	σ Leonis	11. 13. 27, 96	27, 79	—, 17	
	τ Leonis	11. 20. 17, 30	17, 10	—, 20	
	σ Leonis	.. ..	..	..	
	τ Leonis	11. 20. 17, 24	..	..	
Feb. 17	Moon. II. L.	11. 54. 39, 15	..		..
	η Virginis	12. 12. 17, 65	..	..	
	γ Virginis	13. 34. 7, 25	..	..	
	β Capricorni	20. 12. 39, 92	40, 07	+, 15	
	ψ Capricorni	20. 37. 17, 91	..	..	
Oct. 4	Moon. I. L.	20. 57. 55, 67	42, 15		+, 12
	γ Capricorni	21. 31. 51, 93	52, 10	+, 17	
	δ Capricorni	21. 38. 50, 98	51, 01	+, 03	
	μ Piscium	.. ..	..	..	
1852.	o Piscium	1. 37. 34, 07	..	..	
Jan. 28	Moon. I. L.	1. 58. 51, 55	39, 35		..
	ξ^2 Ceti	2. 20. 17, 02	..	..	
	B.A.C. 845	2. 36. 56, 36	..	..	
	δ Arietis	3. 3.	10, 05	..	
	ξ Tauri	3. 19. 8, 80	..	..	
Jan. 30	Moon. I. L.	3. 34. 47, 03	33, 62		, 00
	γ Tauri	4. 11. 22, 49	22, 43	—, 06	
	δ^2 Tauri	4. 15. 34, 07	34, 12	+, 05	
	δ Cancri	8. 36. 16, 70	..	..	
	λ Leonis	9. 23. 16, 66	..	..	
Feb. 5	Moon. II. L.	9. 33. 22, 70	..		..
	α Leonis	10. 0. 29, 68	..	..	
	γ Leonis	10. 11. 48, 87	..	..	

OBSERVATORY, DURHAM.

LONGITUDE DEDUCED FROM MOON AND M.C. STARS.

Day.	Limb.	Stars.	Diff. R.A.	I.	Longitude.
			s.	s.	m. s.
1849.—Nov. 24	I	4	13, 48	127, 25	6. 21, 4
—— Nov. 30	II	3	17, 63	166, 28	21, 9
1850.—Jan. 23	I	4	15, 63	152, 53	8, 9
—— Jan. 26	I	3	17, 47	167, 23	16, 1
—— Feb. 22	I	4	16, 97	161, 65	17, 9
—— Mar. 25	I	3	15, 15	143, 77	19, 4
—— Mar. 26	I	3	14, 59	138, 90	18, 1
—— Mar. 27	II	3	13, 93	135, 04	11, 4
—— Mar. 28	II	2	13, 90	132, 56	17, 5
—— April 22	I	2	14, 25	136, 89	14, 7
—— June 20	I	3	13, 24	127, 42	14, 0
—— June 23	I	2	13, 98	131, 81	21, 8
—— Sept. 21	II	2	12, 81	120, 92	21, 4
—— Oct. 17	I	4	12, 61	120, 53	16, 7
—— Nov. 14	I	4	12, 40	119, 48	13, 6
1851.—Jan. 9	I	2	12, 37	116, 78	21, 6
—— Feb. 14	I	2	16, 91	164, 48	10, 1
—— Feb. 16	II	3	15, 94	153, 00	15, 1
—— Oct. 4	I	3	13, 64	128, 32	22, 7
1852.—Jan. 30	I	2	13, 41	126, 44	6. 21, 8
				Mean..	6. 17, 30

OBSERVATORY, DURHAM.

OCCULTATIONS OF STARS BY THE MOON,

OBSERVED WITH THE FRAUNHOFER EQUATOREAL,

WITH THE EQUATIONS OF CONDITION, DEDUCED FROM THEM,

FOR THE CORRECTION OF THE ASSUMED ELEMENTS,

COMPUTED ACCORDING TO THE METHOD OF PROFESSOR CHALLIS,

PUBLISHED IN THE NAUTICAL ALMANAC FOR 1854.

Assumed Geocentric Colatitude	$35^{\circ}\ 24'\ 43''.80$
Assumed Longitude	$6^{m}\ 19^{s}.75 + \tau^{s}$ West.
Assumed Ratio of the Earth's Axes ..	299 : 300.

Corresponding correction required by the angle of the vertical $= \nu''$.

OCCULTATIONS OF STARS BY THE MOON.

1849.—Nov. $\overset{d.}{30}$..... $\overset{h.}{10}$. $\overset{m.}{43}$. $\overset{s.}{41}$, 5 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Re-appearance of 115 Tauri at the Moon's dark limb.

R. A. of Zenith in arc	..	.. 49. 1. 27, 00 + 15. t
R. A. of Moon in arc	..	.. 79. 35. 21, 75 + x."
N. P. D. of Moon	..	.. 71. 31. 24, 84 + y"
E. H. Par. of Moon	..	.. 1. 1. 8, 48 × (1 +, 001. m)
Semidiameter of Moon	..	.. 0. 16. 39, 64 × (1 +, 001. n) + μ. t
R. A. of Star ..	..	.. 79. 36. 24, 30 + e"
N. P. D. of Star ..	..	.. 72. 10. 25, 50 + f"

Final Equation.

$0 = +22'', 62 + 0, 9593.\ x. - 0, 0594.\ y - 0, 9503.\ e + 0, 0585.\ f + 0, 5064.\ t + 0, 6398.\ \tau + 0, 0083.\ \nu + 0, 9698.\ m - 1, 0127.\ n.$

1850.—Jan. $\overset{d.}{23}$. .... $\overset{h.}{6}$. $\overset{m.}{7}$. $\overset{s.}{1}$, 0 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Re-appearance of γ Tauri at the Moon's bright limb.

An error of 5^s possible. Faint from haze and twilight.

R. A. of Zenith in arc	..	.. 32. 53. 16, 50 + 15. t
R. A. of Moon in arc	..	.. 62. 47. 38, 55 + x."
N. P. D. of Moon	..	.. 74. 10. 5, 30 + y"
E. H. Par. of Moon	..	.. 0. 59. 38, 37 × (1 +, 001. m)
Semidiameter of Moon	..	.. 0. 16. 15, 14 × (1 +, 001. n) + μ. t
R. A. of Star ..	..	.. 62. 49. 2, 70 + e"
N. P. D. of Star	..	.. 74. 44. 29, 10 + f"

Final Equation.

$0 = +14'', 28 + 0, 9364.\ x. + 0, 2781.\ y - 0, 9276.\ e - 0, 2749.\ f + 0, 4044.\ t + 0, 5373.\ \tau + 0, 0033.\ \nu + 1, 6667.\ m - 0, 9871.\ n.$

OCCULTATIONS OF STARS BY THE MOON.

1850.—Jan. $\overset{d.}{23}$. .... $\overset{h.}{9}$. $\overset{m.}{41}$. $\overset{s.}{28}$, 7 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Disappearance of θ^2 Tauri at the Moon's dark limb.

Observation good; but the counting not checked at the end, from the lamp having gone out.

R. A. of Zenith in arc	..	..	86. 39. 1, 50 + 15. t
R. A. of Moon in arc	..	..	64. 58. 46, 65 + x''—
N. P. D. of Moon	..	..	73. 45. 17, 32 + y''
E. H. Par. of Moon	..	..	0. 59. 45, 49 × (1 +, 001. m)
Semidiameter of Moon	..	..	0. 16. 17, 08 × (1 + 001. n) + μ. t
R. A. of Star	..	..	65. 1. 39, 00 + e''
N. P. D. of Star	..	..	74. 28. 8, 10 + f''

Final Equation.

$0 = -7'', 26 - 0, 9319.\ x. - 0, 2898.\ y + 0, 9232.\ e + 0, 2862.\ f$
$- 0, 4075.\ t - 0, 5396.\ \tau + 0, 0089.\ \nu + 0, 0893.\ m - 0, 9898.\ n.$

1850.—Jan. $\overset{d.}{23}$. .... $\overset{h.}{10}$. $\overset{m.}{43}$. $\overset{s.}{21}$, 6 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Re-appearance of θ^2 Tauri at the Moon's bright limb.

Good: might possibly have been traced 2^s earlier.

R. A. of Zenith in arc	..	..	102. 9. 48, 00 + 15. t
R. A. of Moon in arc	..	..	65. 36. 49, 05 + x''—
N. P. D. of Moon	..	..	73. 38. 21, 77 + y''
E. H. Par. of Moon	..	..	0. 59. 47, 52 × (1 +, 001. m)
Semidiameter of Moon	..	..	0. 16. 17, 63 × (1 +, 001. n) + μ. t
R. A. of Star	..	..	65. 1. 39, 00 + e''
N. P. D. of Star	..	..	74. 28. 8, 10 + f''

Final Equation.

$0 = +13'', 67 + 0, 7582.\ x. - 0, 6318.\ y - 0, 7509.\ e + 0, 6266.\ f$
$+ 0, 4268.\ t + 0, 5369.\ \tau + 0, 0014.\ \nu - 2, 4771.\ m - 0, 9892.\ n.$

OCCULTATIONS OF STARS BY THE MOON.

1850.—Jan. $\overset{d.}{23}$. .... $\overset{h.}{10}$. $\overset{m.}{46}$. $\overset{s.}{28}$, 0 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Re-appearance of θ^1 Tauri at the Moon's bright limb.

Very good. Seen coming out.

R. A. of Zenith in arc	..	..	$\overset{\circ}{102}.\ \overset{'}{56}.\ \overset{''}{31}, 50 + 15.\ t$
R. A. of Moon in arc	..	..	$65.\ 38.\ 43, 80 + x''$
N. P. D. of Moon	..	..	$73.\ 38.\ 1, 07 + y''$
E. H. Par. of Moon	..	..	$0.\ 59.\ 47, 62 \times (1 +, 001.\ m)$
Semidiameter of Moon	..	..	$0.\ 16.\ 17, 66 \times (1 +, 001.\ n) + \mu.\ t$
R. A. of Star	..	..	$65.\ 0.\ 14, 70 + e''$
N. P. D. of Star	..	..	$74.\ 22.\ 39, 40 + f''$

Final Equation.

$$0 = + 13'', 39 + 0, 9221.\ x. - 0, 3163.\ y - 0, 9139.\ e + 0, 3155.\ f + 0, 4798.\ t + 0, 6027.\ \tau - 0, 0042\ \nu. - 1, 9689.\ m - 0, 9891.\ n.$$

1850.—Jan. $\overset{d.}{23}$. .... $\overset{h.}{13}$. $\overset{m.}{39}$. $\overset{s.}{6}$, 6 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Disappearance of Aldebaran at the Moon's dark limb.

Not instantaneous, but about 0', 5 going in, as the occultation was a mere graze.

R. A. of Zenith in arc	..	..	$\overset{\circ}{146}.\ \overset{'}{13}.\ \overset{''}{15}, 00 + 15.\ t$
R. A. of Moon in arc	..	..	$67.\ 25.\ 20, 85 + x''$
N. P. D. of Moon	..	..	$73.\ 19.\ 16, 45 + y''$
E. H. Par. of Moon	..	..	$0.\ 59.\ 53, 18 \times (1 +, 001.\ m)$
Semidiameter of Moon	..	..	$0.\ 16.\ 19, 16 \times (1 +, 001.\ n) + \mu.\ t$
R. A. of Star	..	..	$66.\ 49.\ 53, 10 + e''$
N. P. D. of Star	..	..	$73.\ 47.\ 56, 60 + f''$

Final Equation.

$$0 = - 3'', 16 - 0, 0063.\ x. + 1, 0057.\ y + 0, 0036.\ e - 1, 0000.\ f - 0, 0688.\ t - 0, 1106.\ \tau - 0, 0103.\ \nu + 2, 7282.\ m - 0, 9849.\ n.$$

OCCULTATIONS OF STARS BY THE MOON.

1850.—Jan. $\overset{d.}{23}$..... $\overset{h.}{13}$. $\overset{m.}{46}$. $\overset{s.}{26}$, 6 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Re-appearance of Aldebaran at the Moon's bright limb.

Came out very obliquely. I first noticed an increasing redness at the point of emersion.

R. A. of Zenith in arc	..	..	148. 3. 33, 00 + 15. t
R. A. of Moon in arc	..	..	67. 29. 53, 40 + x''
N. P. D. of Moon	..	..	73. 18. 29, 80 + y''
E. H. Par. of Moon	..	..	0. 59. 53, 42 × (1 +, 001. m)
Semidiameter of Moon	..	..	0. 16. 19, 23 × (1 +, 001. n) + μ. t
R. A. of Star	..	..	66. 49. 53, 10 + e''
N. P. D. of Star	..	..	73. 47. 56, 60 + f''

Final Equation.

$0 = -0'', 75 + 0, 2390.\ x. + 0, 9741.\ y - 0, 2413.\ e - 0, 9680.\ f + 0, 0797.\ t + 0, 0451.\ \tau - 0, 0135.\ \nu + 2, 1313.\ m - 0, 9847.\ n.$

1850.—Jan. $\overset{d.}{24}$..... $\overset{h.}{8}$. $\overset{m.}{17}$. $\overset{s.}{34}$, 2 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Disappearance of 115 Tauri at the Moon's dark limb.

Pretty good. The emersion was lost.

R. A. of Zenith in arc	..	..	66. 36. 6, 00 + 15. t
R. A. of Moon in arc	..	..	79. 12. 6, 30 + x''
N. P. D. of Moon	..	..	71. 39. 50, 64 + y''
E. H. Par. of Moon	..	..	1. 0. 26, 19 × (1 +, 001. m)
Semidiameter of Moon	..	..	0. 16. 28, 13 × (1 +, 001. n) + μ. t
R. A. of Star	..	..	79. 36. 27, 90 + e''
N. P. D. of Star	..	..	72. 10. 26, 40 + f''

Final Equation.

$0 = -10'', 02 - 0, 9001.\ x. + 0, 3593.\ y + 0, 8910.\ e - 0, 3522.\ f - 0, 4664.\ t - 0, 6046.\ \tau - 0, 0080.\ \nu + 0, 3454.\ m - 1, 0020.\ n.$

OCCULTATIONS OF STARS BY THE MOON.

1850.—March $^{d.}27$. .... $^{h.}12.\ ^{m.}25.\ ^{h.}36,0 + t^{s.} + \tau^{s.}$ Greenwich M. T.

Disappearance of γ Virginis at the Moon's bright limb.

Mean time of disappearance of the two components is taken.

The difference was estimated at about $0^s, 7$.

R. A. of Zenith in arc	..	.. $189.\ ^{\circ}53.\ '18,\ ''00 + 15.\ ''t$
R. A. of Moon in arc	..	.. $188.\ 19.\ 40,05 + x''$
N. P. D. of Moon	..	.. $89.\ 39.\ 45,96 + y''$
E. H. Par. of Moon	..	.. $0.\ 58.\ 25,55 \times (1 +, 001.\ m)$
Semidiameter of Moon	..	.. $0.\ 15.\ 55,22 \times (1 +, 001.\ n) + \mu.\ t$
R. A. of Star ..	..	.. $188.\ 31.\ 14,85 + e''$
N. P. D. of Star	..	.. $90.\ 37.\ 41,30 + f''$

Final Equation.

$$0 = + 1'', 54 - 0, 7844.\ x. - 0, 6215.\ y + 0, 7767.\ e + 0, 6298.\ f - 0, 4340.\ t - 0, 5497.\ \tau + 0, 0065.\ \nu - 1, 7797.\ m - 0, 9647.\ n.$$

1850.—March $^{d.}27$. .... $^{h.}13.\ ^{m.}35.\ ^{s.}55,7 + t^{s.} + \tau^{s.}$, Greenwich M. T.

Re-appearance of γ Virginis at the Moon's dark limb.

The two components emerged together; apparently from a hollow.

R. A. of Zenith in arc	..	.. $207.\ ^{\circ}31.\ '6,\ ''00 + 15.\ ''t$
R. A. of Moon in arc	..	.. $188.\ 57.\ 53,40 + x''$
N. P. D. of Moon	..	.. $89.\ 53.\ 21,53 + y''$
E. H. Par. of Moon	..	.. $0.\ 58.\ 23,74 \times (1 +, 001.\ m)$
Semidiameter of Moon	..	.. $0.\ 15.\ 54,73 \times (1 +, 001.\ n) + \mu.\ t$
R. A. of Star ..	..	.. $188.\ 31.\ 14,85 + e''$
N. P. D. of Star	..	.. $90.\ 37.\ 41,30 + f''$

Final Equation.

$$0 = + 7'', 73 + 0, 9849.\ x. + 0, 2205.\ y - 0, 9758.\ e - 0, 2185.\ f + 0, 4398.\ t + 0, 5777.\ \tau - 0, 0065.\ \nu - 0, 0074.\ m - 0, 9636.\ n.$$

OCCULTATIONS OF STARS BY THE MOON.

1850.—Oct. 14^{d}.... 7^{h}. 11^{m}. 0^{s}, 8 + t^{s} + τ^{s} Greenwich M. T.

Re-appearance of 19 Capricorni at the Moon's bright limb. First seen when just clear of the limb. Uncertain to two or three seconds.

R. A. of Zenith in arc	..	.. 309° 8′ 27″, 00 + 15″. t
R. A. of Moon in arc	..	.. 311. 49. 14, 40 + x''
N. P. D. of Moon	..	.. 107. 39. 48, 52 + y''
E. H. Par. of Moon	..	.. 0. 54. 10, 93 × (1 +, 001. m)
Semidiameter of Moon	..	.. 0. 14. 45, 84 × (1 +, 001. n) + μ. t
R. A. of Star ..	..	.. 311. 35. 16, 65 + e''
N. P. D. of Star	..	.. 108. 29. 1, 00 + f''

Final Equation.

$0 = +5'', 50 + 0, 9438.\ x. + 0, 1685.\ y - 0, 9348.\ e - 0, 1690.\ f + 0, 3299.\ t + 0, 4659.\ \tau - 0, 0002.\ \nu + 0, 6104.\ m - 0, 8900.\ n.$

1850.—Oct. 14^{d}.... 9^{h}. 57^{m}. 2^{s}, 1 + t^{s} + τ^{s} Greenwich M. T.

Disappearance of 21 Capricorni at the Moon's dark limb. Observed as favourably as possible. Error less than 0^{s}, 3. The emersion was lost, the Moon being obscured.

R. A. of Zenith in arc	..	.. 350° 45′ 34″, 50 + 15″. t
R. A. of Moon in arc	..	.. 313. 13. 41, 70 + x''
N. P. D. of Moon	..	.. 107. 24. 50, 76 + y''
E. H. Par. of Moon	..	.. 0. 54. 11, 03 × (1 +, 001. m)
Semidiameter of Moon	..	.. 0. 14. 45, 86 × (1 +, 001. n) + μ. t
R. A. of Star ..	..	.. 313. 6. 44, 55 + e''
N. P. D. of Star	..	.. 108. 6. 29, 90 + f''

Final Equation.

$0 = +2'', 61 - 0, 8075.\ x. + 0, 5382.\ y + 0, 8024.\ e - 0, 5361.\ f - 0, 3818.\ t - 0, 4597.\ \tau + 0, 0038.\ \nu + 2, 5744.\ m - 0, 8885.\ n.$

OCCULTATIONS OF STARS BY THE MOON.

1852.—Feb. $\overset{d.}{27}$..... $\overset{h.}{10}$. $\overset{m.}{25}$. $\overset{s.}{36}$, 35 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Disappearance of δ^1 Tauri at the Moon's dark limb.

As good as possible. Instantaneous.

R. A. of Zenith in arc	..	..	$\overset{\circ}{131}.\ \overset{'}{43}.\ \overset{''}{51}, 00 + 15.\ t$
R. A. of Moon in arc	..	..	$63.\ 51.\ 47, 25 + x''$
N. P. D. of Moon	..	..	$72.\ 5.\ 47, 98 + y''$
E. H. Par. of Moon	..	..	$0.\ 55.\ 24, 96 \times (1 +, 001.\ m)$
Semidiameter of Moon	..	..	$0.\ 15.\ 6, 08 \times (1 +, 001.\ n) + \mu.\ t$
R. A. of Star	..	..	$63.\ 35.\ 53, 85 + e''$
N. P. D. of Star	..	..	$72.\ 48.\ 36, 90 + f''$

Final Equation.

$$0 = -7'', 27 - 0, 9346.\ x. - 0, 2236.\ y + 0, 9318.\ e + 0, 2204.\ f - 0, 4182.\ t - 0, 4621.\ \tau + 0, 0143.\ \nu + 1, 2327.\ m - 0, 9127.\ n.$$

1852.—Feb. $\overset{d.}{27}$..... $\overset{h.}{11}$. $\overset{m.}{24}$. $\overset{s.}{41}$, 0 + $\overset{s.}{t}$ + $\overset{s.}{\tau}$ Greenwich M. T.

Re-appearance of δ^1 Tauri at the Moon's bright limb.

The star was just clearing the irradiation-light when first seen.

R. A. of Zenith in arc	..	..	$\overset{\circ}{146}.\ \overset{'}{32}.\ \overset{''}{27}, 00 + 15.\ t$
R. A. of Moon in arc	..	..	$64.\ 22.\ 48, 15 + x''$
N. P. D. of Moon	..	..	$71.\ 58.\ 28, 87 + y''$
E. H. Par. of Moon	..	..	$0.\ 55.\ 26, 61 \times (1 +, 001.\ m)$
Semidiameter of Moon	..	..	$0.\ 15.\ 6, 53 \times (1 +, 001.\ n) + \mu.\ t$
R. A. of Star	..	..	$63.\ 35.\ 53, 85 + e''$
N. P. D. of Star	..	..	$72.\ 48.\ 36, 90 + f''$

Final Equation.

$$0 = +8'', 85 + 0, 8034.\ x. - 0, 5444.\ y - 0, 8009.\ e + 0, 5451.\ f + 0, 4516.\ t + 0, 4894.\ \tau - 0, 0059.\ \nu - 2, 9816.\ m - 0, 9112.\ n.$$

OCCULTATIONS OF STARS BY THE MOON.

1852.—Feb. 27^{d}. .... 11^{h}. 37^{m}. 39^{s}, $4 + t^{s} + \tau^{s}$ Greenwich M. T.

Re-appearance of δ^{2} Tauri at the Moon's bright limb.

Not quite so well. Uncertain to 2ˢ. The emersion was very oblique.

R. A. of Zenith in arc*	..	.. 149° 47′ 34″, 50 + 15″. t
R. A. of Moon in arc	..	.. 64. 29. 37, 35 + x''
N. P. D. of Moon	..	.. 71. 56. 53, 04 + y''
E. H. Par. of Moon	..	.. 0. 55. 26, 97 × (1 +, 001. m)
Semidiameter of Moon	..	.. 0. 15. 6, 63 × (1 + 001. n) + μ. t
R. A. of Star ..	..	.. 63. 53. 23, 10 + e''
N. P. D. of Star	..	.. 72. 54. 16, 20 + f''

Final Equation.

$0 = +6'', 34 + 0, 1384.\ x. - 0, 9907.\ y - 0, 1556.\ e + 0, 9866.\ f + 0, 1629.\ t + 0, 2052.\ \tau + 0, 0070.\ \nu - 2, 8329.\ m - 0, 9109.\ n.$

1852.—Feb. 27^{d}. .... 11^{h}. 55^{m}. 35^{s}, $9 + t^{s} + \tau^{s}$ Greenwich M. T.

Disappearance of δ^{2} Tauri at the Moon's dark limb.

Excellent. Perfectly instantaneous.

R. A. of Zenith in arc	..	.. 154° 17′ 25″, 50 + 15″. t
R. A. of Moon in arc	..	.. 64. 39. 3, 60 + x''
N. P. D. of Moon	..	.. 71. 54. 40, 86 + y''
E. H. Par. of Moon	..	.. 0. 55. 27, 48 × (1 +, 001. m)
Semidiameter of Moon	..	.. 0. 15. 6, 77 × (1 +, C01. n) + μ. t
R. A. of Star ..	..	.. 64. 13. 50, 40 + e''
N. P. D. of Star	..	.. 72. 24. 56, 10 + f''

Final Equation.

$0 = -2'', 37 - 0, 5140.\ x. + 0, 8460.\ y + 0, 5116.\ e - 0, 8438.\ f - 0, 3382.\ t - 0, 3743.\ \tau - 0, 0004.\ \nu + 3, 2260.\ m - 0, 9104.\ n.$

OBSERVATORY, DURHAM.

AN ACCOUNT
OF THE DETERMINATION OF THE LONGITUDE OF THE OBSERVATORY,
BY THE TRANSMISSION OF CHRONOMETERS BETWEEN GREENWICH AND DURHAM, IN THE YEAR 1851.

LONGITUDE BY CHRONOMETERS.

For some time previous to the carrying out of the following operation, it had been considered desirable to procure some better value of the Longitude than it seemed possible to elicit from observations of the Moon and Moon-culminating Stars. At the last meeting of the Curators in the year 1850, it was resolved forthwith to try the method of direct interchange of time by the conveyance of chronometers between the two Observatories of Greenwich and Durham.

Professor Chevallier, on the part of the Curators, made application to the Astronomer-Royal for his consent to the necessary access to the Greenwich transit-clock and meridian instrument, and to the Messrs. Reid, of Newcastle, for the loan of the chronometers required. The observations, and the conveyance of the chronometers by railway, were left to me.

Judging by the similar, but more extended, operation of the determination of the longitude of Valentia by the Astronomer Royal, we were led in the first instance to apply for the use of ten or twelve pocket chronometers; but meeting with a difficulty in getting the requisite number, we eventually set about the work with three marine box-chronometers and three pocket chronometers, which the Messrs. Reid procured on loan. The Messrs. Reid very handsomely declined any compensation for the assistance which they thus rendered us. From some cause, the pocket chronometers entirely broke down in our case, and after ascertaining their daily rates, it was found necessary to reject them. The following consecutive daily rates of one of them

69^s, 85^s, 80^s, 79^s, 70^s, 75^s, 93^s, 82^s, 95^s, gaining,

sufficiently shewed, that it would have been useless to discuss any result given by them. This failure may have arisen from the inferiority of the pocket chronometers supplied to us, or from the neglect of some precaution in the use of them, of the necessity of which I was not aware. The three box-chronometers, on the other hand, performed very satisfactorily on the whole, and have yielded more accordant results than we could have expected beforehand.

LONGITUDE BY CHRONOMETERS.

The chronometers were received at the Observatory on the 4th of January, and were rated daily till the 17th, by separately comparing each with the transit-clock, between the hours of 10 and 11 A.M., by noting the moment of the coincidence of beats. Two comparisons were always made, the one as a check on the other, and the one which was considered the more precise was made use of. The weather between the 4th and the 17th was sufficiently favourable for me to keep an almost daily check on the clock error. At 10^h P.M. on the 17th, after again comparing each chronometer with the transit-clock, I left Durham by night mail-train, on the first up-journey, and arrived at Greenwich at about 2^h P.M. on the 18th, when comparisons with the Greenwich transit-clock were immediately made. I then waited, the day being clear, till I had secured observations of four clock-stars, after which the chronometers were deposited for safety in the chronometer-room of the Royal Observatory, where, during their stay, they were rated daily along with those on trial for the Admiralty. On the afternoon of the 27th, I succeeded in procuring observations of eight clock-stars, and after comparing the chronometers with the transit-clock, left Greenwich at 7^h P.M., on the first down-journey, arriving at Durham shortly after 9^h A.M. on the 28th. The chronometers were again compared with the transit-clock, and a sufficient number of clock-stars were observed the same day. By having been thus fortunate in the weather, the results of the first journey were rendered independent of the personal equation of the observer.

On the journeys, the chronometers were packed in a deal case of sufficient length to contain all three, which rested on three padded feet, and admitted of being placed under the seat of a first-class railway carriage. In this case they were placed side by side, clamped in their gimbals, and surrounded by horse-hair stuffing for the diminution of the effect of vibration. The case was provided with convenient handles at each end, by which it was carried between all trains and carriages between two men, who were instructed to walk in step and to swing the case as little as possible. On no occasion did it receive the slightest blow.

From the 28th to the end of January, the chronometers were then rated daily, as before, when the work of the first journey was considered to be concluded. I then reversed the transit in its Ys, to eliminate, in the second operation, any error arising from a residual collimation error. The chronometers were again rated daily till the 4th of February, when, as before, I conveyed them by night mail-train to Greenwich, making similar comparisons with the clocks at the two Observatories to those before described. There being no likelihood of stars being visible at Greenwich on the night of the 5th, I re-

turned to Durham the same evening, where, on my arrival on the 6th, I was more fortunate, and obtained the observations of stars which were required the same day. Transits were obtained at Greenwich on the 4th and on the 6th, in sufficient number, so that the principal uncertainty attaching to the second operation arises from any error in the assumption of the uniform rate of the Greenwich transit-clock, and in the personal equation applied.

My personal equation was found from the transit-observations taken at Greenwich on Jan. 18 and 27, and is, as expressed in the preface to the Greenwich observations,

$$\text{Dunkin} - \text{Carrington} = + 0^s, 10.$$

In the reduction, it has not been attempted to determine travelling rates: it has been assumed that the vibration on the journeys caused equal deviations from the stationary rates of the time. The effect on the result, on this assumption, disappears in the mean of one up and one down-journey of the same chronometer. For the first journey, two rates were applied, one for the up, another for the down-journey: for the second, one rate throughout was found to be sufficient. These stationary rates were adopted from those immediately preceding and following the times of travelling. To the individual results weights were applied, inversely proportional to the irregularities of rate of each chronometer.

To those Nautical Almanac stars which were used at Durham for finding the clock-error, corrections were applied, identical with those applied at Greenwich.

In converting sidereal time at Durham into Durham mean time, the mean time of transit of the first point of Aries over the meridian of Durham was assumed equal to the time given in the Nautical Almanac for the meridian of Greenwich, increased by $1^s, 04$.

R. C. CARRINGTON.

OBSERVATORY, DURHAM.

LONGITUDE GIVEN BY HORNBY 771, ON THE FIRST JOURNEY.

1851.	T. by Chron.	on Durham M. T.	Diff.	Rate.
	d. h. m. s.	m. s.	s.	s.
Jan. 5.....	22. 40. 10, 5	fast 14. 47, 49		
— 6.....	22. 48. 25, 0	43, 97	— 3, 52	— 3, 5
— 7.....	22. 39. 35, 5	42, 33	— 1, 64	— 1, 7
— 8.....	22. 12. 30, 0	40, 58	— 1, 75	— 1, 8
— 9.....	23. 42. 35, 5	36, 90	— 3, 68	— 3, 5
— 11.....	22. 30. 5, 5	35, 51	— 1, 39	— 0, 7
— 12.....	22. 58. 0, 0	36, 81	+ 1, 30	+ 1, 3
— 14.....	23. 13. 55, 5	40, 08	+ 3, 27	+ 1, 6
— 16.....	23. 33. 30, 5	42, 38	+ 2, 30	+ 1, 1
— 17.....	10. 17. 0, 5	fast 14. 43, 42	+ 1, 04	+ 2, 3
		on Greenwich M. T.		
Jan. 18.....	2. 35. 35, 0	fast 8. 22, 94		
— 19.....	0. 34. 39, 0	22, 99	+ 0, 05	+ 0, 1
— 20.....	1. 48. 45, 5	23, 44	+ 0, 45	+ 0, 4
— 21.....	1. 41. 0, 0	23, 6	+ 0, 16	+ 0, 2
— 22.....	2. 8. 0, 0	25, 2	+ 1, 6	+ 1, 6
— 23.....	2. 0. 0, 0	26, 3	+ 1, 1	+ 1, 1
— 24.....	2. 5. 0, 0	25, 9	— 0, 4	— 0, 4
— 25.....	1. 20. 45, 5	27, 52	+ 1, 62	+ 1, 7
— 27.....	6. 27. 30, 0	fast 8. 30, 26	+ 2, 74	+ 1, 2
		on Durham M. T.		
Jan. 28.....	0. 44. 20, 5	fast 14. 49, 66		
— 28.....	23. 42. 35, 0	49, 10	— 0, 56	— 0, 6
— 30.....	23. 35. 20, 0	fast 14. 48, 42	— 0, 68	— 0, 3

Whence are adopted

Stationary rate for up-journey .. .. + 1, 0 .

————————down-journey .. .. + 0, 3 .

	d. h. m. s.	m. s.
Durham.—Jan. 17.	10. 17. 0, 5	fast 14. 43, 42
Rate for	16. 18. 34, 5	+ 0, 68
∴ at Jan. 18.	2. 35. 35, 0	14. 44, 10
But observed at Greenwich ..		8. 22, 94
Difference ..		6. 21, 16

	d. h. m. s.	m. s.
Greenwich.—Jan. 27.	6. 27. 30, 0	fast 8. 30, 26
Rate for	18. 16. 50, 5	+ 0, 23
∴ at Jan. 28.	0. 44. 20, 5	8. 30, 49
But observed at Durham ..		14. 49, 66
Difference ..		6. 19, 17

Mean difference 6. 20, 16.

OBSERVATORY, DURHAM.

LONGITUDE GIVEN BY REID 1109, ON THE FIRST JOURNEY.

1851. d.	T. by Chron. h. m. s.	on Durham M. T. m. s.	Diff. s.	Rate. s.
Jan. 5.....	22. 42. 20, 0	fast 8. 15, 42		
— 6.....	22. 57. 40, 0	19, 54	+ 4, 12	+ 4, 1
— 7.....	22. 42. 55, 5	23, 91	+ 4, 37	+ 4, 4
— 8.....	22. 17. 55, 0	28, 49	+ 4, 58	+ 4, 7
— 9.....	23. 43. 45, 0	33, 59	+ 5, 10	+ 4, 8
— 11.....	22. 30. 50, 0	43, 10	+ 9, 51	+ 4, 9
— 12.....	22. 56. 30, 5	8. 51, 01	+ 7, 91	+ 7, 7
— 14.....	23. 15. 15, 0	9. 8, 69	+ 17, 68	+ 8, 8
— 16.....	23. 33. 20, 0	28, 70	+ 20, 01	+ 10, 0
— 17.....	10. 14. 10, 0	fast 9. 33, 30	+ 4, 60	+ 10, 3
		on Greenwich M. T.		
Jan. 18.....	2. 40. 40, 0	fast 8. 20, 60		
— 19.....	0. 31. 45, 5	30, 81	+ 10, 21	+ 11, 2
— 20.....	1. 46. 50, 5	42, 90	+ 12, 09	+ 11, 6
— 21.....	1. 37. 0, 0	3. 54, 6	+ 11, 7	+ 11, 8
— 22.....	2. 4. 0, 0	4. 7, 2	+ 12, 6	+ 12, 3
— 23.....	1. 57. 0, 0	20, 1	+ 12, 9	+ 18, 0
— 24.....	2. 2. 0, 0	32, 7	+ 12, 6	+ 12, 6
— 25.....	1. 26. 50, 5	4. 47, 12	+ 14, 42	+ 14, 7
— 27.....	6. 33. 35, 5	fast 5. 18, 29	+ 31, 17	+ 14, 1
		on Durham M. T.		
Jan. 28.....	0. 50. 40, 0	fast 11. 48, 70		
— 28.....	23. 42. 20, 0	12. 2, 52	+ 13, 82	+ 14, 5
— 30.....	23. 35. 15, 5	fast 12. 30, 29	+ 27, 77	+ 13, 9

Whence are adopted

Stationary rate for up-journey .. .. + 10, 6 s.

——————down-journey .. .. + 14, 4 s.

	d.	h. m. s.		m. s.
Durham.—Jan.	17.	10. 14. 10, 0	fast	9. 33, 30
Rate for	.....	16. 26. 30, 0	.....	+ 7, 26
∴ at Jan.	18.	2. 40. 40, 0	.....	9. 40, 56
But observed at Greenwich ..			..	3. 20, 60
			Difference ..	6. 19, 96

	d.	h. m. s.		m. s.
Greenwich.—Jan.	27.	6. 33. 35, 5		5. 18, 29
Rate for	.....	18. 17. 4, 5	.....	+ 10, 97
∴ at Jan.	28.	0. 50. 40, 0	fast	5. 29, 26
But observed at Durham ..			..	11. 48, 70
			Difference ..	6. 19, 44

Mean difference 6. 19, 70.

LONGITUDE GIVEN BY HARRISON 476, ON THE FIRST JOURNEY.

1851.	T. by Chron.	on Durham M. T.	Diff.	Rate.
d.	h. m. s.	m. s.	s.	s.
Jan. 5.....	22. 53. 10, 0	fast 7. 30, 33		
— 6.....	23. 3. 5, 0	27, 57	— 2, 76	— 2, 7
— 7.....	22. 50. 35, 0	26, 86	— 0, 71	— 0, 7
— 8.....	22. 22. 35, 0	26, 43	— 0, 43	— 0, 4
— 9.....	23. 43. 35, 5	23, 25	— 3, 18	— 3, 0
— 11.....	22. 35. 35, 5	18, 61	— 4, 64	— 2, 4
— 12.....	23. 0. 30, 5	17, 92	— 0, 69	— 0, 7
— 14.....	23. 19. 25, 0	18, 69	+ 0, 77	+ 0, 4
— 16.....	23. 37. 20, 0	17, 74	— 0, 95	— 0, 5
— 17.....	10. 21. 21, 0	fast 7. 17, 86	+ 0, 12	+ 0, 3
		on Greenwich M. T.		
Jan. 18.....	2. 40. 30, 0	fast 0. 56, 97		
— 19.....	0. 25. 12, 5	57, 15	+ 0, 18	+ 0, 2
— 20.....	1. 40. 30, 5	56, 32	— 0, 83	— 0, 8
— 21.....	1. 35. 0, 0	56, 6	+ 0, 3	+ 0, 3
— 22.....	2. 1. 0, 0	57, 2	+ 0, 6	+ 0, 6
— 23.....	1. 54. 0, 0	56, 6	— 0, 6	— 0, 6
— 24.....	1. 59. 0, 0	56, 1	— 0, 5	— 0, 5
— 25.....	1. 29. 40, 5	55, 22	— 0, 88	— 0, 9
— 27.....	6. 35. 45, 0	fast 0. 52, 87	— 2, 35	— 1, 1
		on Durham M. T.		
Jan. 28.....	0. 56. 10, 5	fast 7. 10, 85		
— 28.....	23. 39. 30, 5	10, 36	— 0, 49	— 0, 5
— 30.....	23. 31. 20, 5	fast 7. 8, 53	— 1, 83	— 0, 9

Whence are adopted

	s.
Stationary rate for up-journey	+ 0, 25
——————down-journey	— 0, 80

	d.	h. m. s.		m. s.
Durham.—Jan. 17.		10. 21. 21, 0	fast	7. 17, 86
Rate for		16. 19. 9, 0	.....	+ 0, 16
∴ at Jan. 18.		2. 40. 30, 0	.....	7. 18, 02
But observed at Greenwich ..			..	0. 56, 97
		Difference	..	6. 21, 05

	d.	h. m. s.		m. s.
Greenwich.—Jan. 27.		6. 35. 45, 0	fast	0. 52, 87
Rate for		18. 20. 25, 5	.....	— 0, 65
∴ at Jan. 28.		0. 56. 10, 5		0. 52, 22
But observed at Durham ..			..	7. 10, 85
		Difference	..	6. 18, 63

Mean difference 6. 19, 84.

LONGITUDE GIVEN BY HORNBY AND REID, ON THE SECOND JOURNEY.

1851.	T. by Chron.	on Durham M. T.	Diff.	Rate.
d.	h. m. s.	m. s.	s.	s.
Feb. 0.....	23. 53. 30, 0	fast 14. 48, 47		
— 2.....	0. 20. 0, 5	48, 56	+ 0, 09	+ 0, 1
— 3.....	1. 15. 50, 0	47, 51	— 1, 05	— 1, 0
— 3.....	12. 37. 0, 5	47, 66	+ 0, 15	+ 0, 3
— 3.....	22. 23. 45, 5	47, 67	+ 0, 01	+ 0, 0
— 4.....	10. 27. 55, 0	fast 14. 47, 99	+ 0, 32	+ 0, 6
Feb. 5.....	4. 2. 5, 0	fast 8. 27, 10	on G.M.T.	
— 5.....	7. 4. 30, 0	27, 02		
Feb. 5.....	22. 52. 0, 0	fast 14. 45, 39	on D.M.T.	
— 6.....	7. 39. 25, 5	45, 70	+ 0, 31	+ 0, 8
— 7.....	7. 24. 10, 5	45, 34	— 0, 36	— 0, 4
— 7.....	22. 30. 50, 0	fast 14. 45, 24	— 0, 10	— 0, 2

Adopted rate for time of travelling .. .. s. 0, 0

	d.	h. m. s.	m. s.	
Durham.—Feb.	4. ..	10. 27. 55, 0	fast 14. 47, 99	
—	5. ..	22. 52. 0, 0	.... 45, 39	
Mean	5. ..	4. 39. 57, 5	fast 14. 46, 69	
Rate for.....		0. 53. 20, 0	.... 0, 00	
∴ at Feb.	5. ..	5. 33. 17, 5	fast 14. 46, 69	
But observed at Greenwich			.. 8. 27, 06	
Difference			.. 6. 19, 63	by Hornby.

1851.	T. by Chron.	on Durham M. T.	Diff.	Rate.
d.	h. m. s.	m. s.	s.	s.
Feb. 0.....	23. 52. 30, 0	fast 12. 44, 65		
— 2.....	0. 22. 15, 0	12. 59, 73	+ 15, 08	+ 14, 8
— 3.....	1. 15. 50, 0	13. 14, 77	+ 15, 04	+ 14, 4
— 3.....	12. 46. 45, 0	22, 00	+ 7, 23	+ 15, 1
— 3.....	22. 24. 25, 5	27, 99	+ 5, 99	+ 15, 0
— 4.....	10. 31. 0, 0	fast 13. 35, 70	+ 7, 71	+ 15, 3
Feb. 5.....	4. 6. 30, 0	fast 7. 26, 99	on G.M.T.	
— 5.....	7. 5. 45, 5	28, 89		
Feb. 5.....	23. 1. 10, 5	fast 13. 58, 53	on D.M.T.	
— 6.....	7. 42. 15, 5	14. 4, 28	+ 5, 75	+ 15, 9
— 7.....	7. 26. 45, 5	19, 83	+ 15, 55	+ 15, 6
— 7.....	22. 32. 55, 0	fast 14. 29, 62	+ 9, 79	+ 15, 6

Adopted rate for time of travelling .. .. s. + 15, 3

	d.	h. m. s.	m. s.	
Durham.—Feb.	4. ..	10. 31. 0, 0	fast 13. 35, 70	
—	5. ..	23. 1. 10, 5	.... 58, 53	
Mean	5. ..	4. 46. 5, 3	fast 13. 47, 12	
Rate for		0. 50. 2, 5	.... + 0, 53	
∴ at Feb.	5. ..	5. 36. 7, 8	fast 13. 47, 65	
But observed at Greenwich			.. 7. 27, 94	
Difference			.. 6. 19, 71	by Reid.

OBSERVATORY, DURHAM.

LONGITUDE GIVEN BY HARRISON, ON THE SECOND JOURNEY.

1851.	T. by Chron.	on Durham M. T.	Diff.	Rate.
	d. *h.* *m.* *s.*	*m.* *s.*	*s.*	*s.*
Feb. 0.....	23. 47. 15, 0	fast 7. 5, 71		
— 2.....	0. 18. 50, 0	5, 14	— 0, 57	— 0, 6
— 3.....	1. 11. 0, 0	2, 98	— 2, 16	— 2, 1
— 3.....	12. 42. 35, 5	1, 86	— 1, 12	— 2, 3
— 3.....	22. 21. 0, 5	1, 49	— 0, 37	— 0, 9
— 4.....	10. 31. 20, 0	fast 7. 0, 83	— 0, 66	— 1, 3
		on Greenwich M. T.		
Feb. 5.....	4. 4. 30, 0	fast 0. 39, 77		
— 5.....	7. 3. 0, 5	39, 56		
		on Durham M. T.		
Feb. 5.....	23. 1. 0, 0	fast 6. 58, 15		
— 6.....	7. 38. 15, 5	57, 79	— 0, 36	— 1, 0
— 7.....	7. 23. 15, 0	56, 97	— 0, 82	— 0, 8
— 7.....	22. 27. 40, 5	fast 6. 56, 50	— 0, 47	— 0, 8

Adopted rate for time of travelling .. .. — 1, 3 *s.*

	d.	*h.* *m.* *s.*		*m.* *s.*
Durham.—Feb.	4. ..	10. 31. 20, 0	fast	7. 0, 83
—	5. ..	23. 1. 0, 0	....	6. 58, 15
Mean	5. ..	4. 46. 10, 0	fast	6. 59, 49
Rate for.....		0. 47. 35, 3	....	— 0, 04
∴ at Feb.	5. ..	5. 33. 45, 3	fast	6. 59, 45
But observed at Greenwich			..	0. 39, 67
		Difference	..	6. 19, 78 by Harrison.

THE SIX RESULTS COMBINED.

Applying rough weights inversely proportional to the probable errors due to uncertainty of rate, we find

	m. *s.*	
By Hornby, first journey	6. 20, 16	weight 1
— Reid, ————	19, 70	——— 5
— Harrison, ————	19, 84	——— 1
Result of first journey	*m.* *s.* 6. 19, 79	West.
By Hornby, second journey	*m.* *s.* 6. 19, 63	weight 1
— Reid, ————	19, 71	——— 2
— Harrison, ————	19, 78	——— 2
Result of second journey	*m.* *s.* 6. 19, 72	West.

Adopted Longitude

m. *s.*
6. 19, 75 West of Greenwich.

OBSERVATORY, DURHAM.

MEAN R.A. AND N.P.D. FOR 1853,

OF CERTAIN STARS OF COMPARISON,

USED IN DIFF. OBS. WITH THE FRAUNHOFER EQUATOREAL, DURHAM,

RE-OBSERVED BY MR. CARRINGTON, AT REDHILL OBSERVATORY,

AND INCORPORATED INTO THE GENERAL CATALOGUE WHICH FOLLOWS.

REDHILL OBSERVATIONS OF DURHAM COMPARISON-STARS.

Name.	1853.	Mag.	R.A. 1853, 0.	N. P. D., 1853, 0.	
			h. m. s.	° ′ ″	
W. 23. 252	Nov. 17	10	23. 12. 41, 09	85. 29. 19, 5	
	18	9	40, 99	20, 4	
	21	—	41, 13	18, 9	
	22	9½	41, 11	18, 8	
W. 23. 395	Nov. 9	—	23. 19. 50, 86	82. 44. 33, 1	
	17	8	50, 67	31, 1	
	19	8	50, 80	31, 5	
	21	8	50, 75	30, 7	
	23	7½	50, 73	31, 8	
W. 23. 458	Nov. 18	9	23. 22. 53, 19	84. 23. 2, 5	
	22	9	53, 27	1, 6	
W. 23. 469	Nov. 21	8½	23. 23. 26, 63	82. 46. 47, 5	
....	Nov. 19	8½	23. 23. 28, 01	81. 19. 36, 0	
....	Nov. 17	10½	23. 25. 57, 63	80. 46. 33, 6	
	22	10	57, 66	33, 4	
W. 23. 568	Nov. 18	7	23. 27. 44, 68	78. 8. 54, 3	
	23	8	44, 67	52, 6	
W. 23. 596	Nov. 19	9½	23. 28. 46, 72	80. 18, 24, 1	
	22	10	46, 72	24, 5	
W. 23. 605	Nov. 21	9	23. 29. 30, 52	79. 47. 53, 0	
W. 23. 647	Nov. 17	7	23. 31. 26, 37	78. 37. 7, 7	
	23	8	26, 43	8, 3	
W. 23. 656	Nov. 18	11	23. 31. 52, 80	79. 2. 21, 2	
B.A.C. 8234	Nov. 19	6	23. 32. 25, 75	81. 8. 10, 3	
	22	7½	25, 80	10, 1	
W. 23. 712	Nov. 21	9	23. 34. 32, 88	78. 4. 13, 9	
	23	9	32, 63	12, 9	
W. 23. 775	Nov. 17	6	23. 37. 52, 48	80. 38. 8, 9	
	18	7	52, 42	8, 6	
	19	8	52, 30	8, 7	
	22	7	52, 44	8, 3	
W. 23. 927	Nov. 17	8	23. 45. 29, 61	78. 53. 30, 3	
	19	8½	29, 63	30, 7	
	23	9	29, 65	30, 4	

REDHILL OBSERVATIONS OF DURHAM COMPARISON-STARS.

Name.	1853.	Mag.	R. A., 1853, 0.	N. P. D., 1853, 0.	
			h. m. s.	° ′ ″	
W. 23. 983	Nov. 18	8	23. 48. 6, 79	82. 35. 39, 9	
	21	—	6, 85	39, 7	
	22	8	6, 73	39, 4	
W. 23. 1010	Nov. 17	10	23. 49. 28, 96	79. 35. 58, 3	
	19	9	29. 00	57, 0	
	23	9	28, 87	56, 0	
W. 23. 1222	Nov. 17	8	23. 59. 32, 51	83. 56. 30, 1	
	18	8	32, 36	30, 5	
W. 23. 1236	Nov. 19	10	0. 0. 9, 20	77. 44. 4, 6	
	23	10	9, 19	4, 6	
W. 23. 1249	Nov. 22	8	0. 0. 46, 78	99. 38. 27, 4	
W. 23. 1252	Nov. 21	10	0. 0. 59, 81	84. 2. 6, 2	
W. 0. 89	Nov. 17	9	0. 5. 29, 14	83. 55. 20, 0	
	23	9½	29, 07	20, 3	
W. 0. 97	Nov. 18	8	0. 6.	83. 52. 42, 1	
	19	9	10, 77	41, 2	
	22	10	10, 76	41, 2	
W. 0. 102	Nov. 21	10	0. 6. 30, 29	102. 7. 17, 4	
W. 0. 169	Nov. 17	9	0. 10. 8, 12	83. 3. 25, 9	
	18	9	(7, 64)	25, 0	
	21	10	8, 08	25, 2	
	22	10	8, 02	25, 3	
W. 0. 192	Oct. 29	—	0. 11. 34, 16	83. 32. 5, 0	
	Nov. 9	8	34, 07	4, 8	
	19	9	33, 97	4, 3	
W. 0. 280	Nov. 17	10	0. 16. 23, 03	80. 53. 31, 5	
	21	11	23, 20	32, 3	
	22	11	23, 21	30, 9	
W. 0. 318	Nov. 18	8	0. 19. 19, 72	82. 15. 6, 5	
	19	8	19, 71	6, 0	
	23	9	19, 69	5, 9	
W. 0. 375	Nov. 9	8	0. 22. 56, 17	82. 18. 2, 5	
	17	9	56, 13	0, 9	
	21	9½	56, 17	0, 4	
	22	9	56, 19	0, 7	

REDHILL OBSERVATIONS OF DURHAM COMPARISON-STARS.

Name.	1853.	Mag.	R. A., 1853, 0.	N. P. D., 1853, 0.	
			h. m. s.	° ′ ″	
W. 0. 436	Nov. 18	9	0. 25. 52, 81	81. 2. 26, 4	
	19	—	52, 81	26, 8	
	21	10	52, 89	25, 9	
	23	8	52, 96	26, 0	
W. 0. 514	Nov. 9	—	0. 30. 30, 71	80. 58. 45, 4	
W. 1. 489	Nov. 9	—	1. 28. 18, 46	88. 1. 18, 3	
	18	9½	18, 57	17, 1	
	21	11	18, 61	17, 3	
	22	10	18, 43	16, 7	
W. 1. 526	Nov. 17	9½	1. 30. 31, 45	80. 14. 28, 4	
	Dec. 30	10	31, 47	28, 0	
W. 1. 540	Nov. 22	11	1. 31. 20, 32	86. 37. 31, 7	
W. 1. 555	Nov. 21	10	1. 31. 40, 48	80. 4. 27, 9	
.....	Nov. 9	10	1. 33. 49, 99	79. 6. 53, 2	
	18	10	49, 86	53, 2	
W. 1. 620	Nov. 17	7	1. 34. 17, 98	88. 2. 26, 6	
	23	8½	17, 91	26, 7	
W. 1. 633	Oct. 29	—	1. 34. 50, 17	80. 29. 53, 6	
	Nov. 19	8	50, 00	53, 7	
	21	9	50, 11	53, 9	
	22	8	50, 09	52, 9	
B.A.C. 542	Nov. 9	7	1. 39. 21, 68	79. 53. 33, 3	
	17	8	21, 62	32, 3	
	23	8	21, 48	30, 7	
.....	Nov. 18	10	1. 41. 29, 67	81. 2. 52, 9	
	21	10	29, 79	54, 6	
W. 1. 756	Nov. 22	10	1. 42. 32, 06	80. 55. 14, 3	
W. 1. 801	Nov. 17	9	1. 44. 52, 55	81. 8. 26, 6	
	21	10	52, 53	26, 4	
	23	9	52, 48	27, 1	
W. 1. 860	Nov. 9	10	1. 47. 59, 31	87. 8. 41, 1	
	18	9	59, 33	41, 3	
	19	8	59, 35	40, 5	
	21	10	59, 40	41, 7	
	22	10	59, 35	40, 7	

REDHILL OBSERVATIONS OF DURHAM COMPARISON-STARS.

Name.	1853.	Mag.	R. A., 1853, 0.	N. P. D., 1853, 0.	
			h. m. s.	° ′ ″	
W. 1. 962	Nov. 17	9	1. 54. 1, 57	87. 1. 41, 1	
	18	8	1, 53	40, 9	
	21	9	1, 58	41, 7	
W. 1. 984	Nov. 9	—	1. 55. 3, 80	86. 51. 52, 2	
	19	9	3, 84	50, 4	
	22	9½	3, 79	50, 4	
W. 2. 35	Nov. 9	10	2. 3. 54, 08	85. 55. 40, 4	
	21	10	54, 25	41, 0	
W. 2. 51	Nov. 17	9½	2. 4. 20, 74	86. 6. 11, 2	
	19	9	20, 85	11, 2	
	23	9	(20, 46)	12, 1	
B.A.C. 687	Nov. 18	7	2. 5. 48, 81	85. 40. 34, 0	
	22	7½	48, 72	34, 8	
W. 2. 78	Dec. 30	9	2. 6. 4, 28	86. 9. 23, 2	
W. 2. 112	Nov. 9	9	2. 8. 6, 43	85. 2. 9, 0	
	19	9	6, 42	8, 2	
	22	10	6, 37	8, 2	
W. 2. 158	Nov. 17	8	2. 10. 54, 84	82. 30. 2, 2	
	18	8	54, 30	1, 7	
	21	7	54, 81	0, 2	
W. 2. 309	Nov. 9	10	2. 19. 7, 57	83. 2. 24, 8	
	17	10	7, 55	25, 6	
	21	10	7, 56	23, 1	
	22	11	7, 46	24, 4	
W. 2. 347	Nov. 18	9	2. 21. 11, 55	82. 16. 51, 7	
	19	9	11, 46	50, 7	

OBSERVATORY, DURHAM.

GENERAL CATALOGUE

OF COMPARISON STARS,

USED WITH THE FRAUNHOFER EQUATOREAL,

AS CONCLUDED FROM RECENT OBSERVATIONS AT GREENWICH,

EDINBURGH, AND REDHILL.

(REFERRED TO IN THE NEXT SECTION).

COMPARISON-STARS FOR THE EQUATOREAL.

Reference Number.	Obs. in R.A.	Mean R.A., 1852, 0.	Prec.	Obs. in N.P.D.	Mean N.P.D., 1852, 0.	Prec.	
		h. m. s.	s.		° ′ ″	″	
1	3	0. 0. 6,17	+3,071	2	77. 44. 24, 6	− 20, 05	
2	1	0. 0. 14, 09	3, 071	1	101. 57. 6, 3	20, 05	
3	2	0. 0. 43, 70	3, 070	2	99. 38. 48, 1	20, 05	
4	2	0. 0. 49, 74	3, 071	0	84. 12. 26, 5	20, 05	
5	1	0. 0. 56, 74	3, 072	1	84. 2. 26, 2	20, 05	
6	1	0. 1. 38, 24	3, 073	0	81. 12. 45, 0	20, 05	
7	2	0. 3. 43, 09	3, 076	2	77. 45. 58, 9	20, 05	
8	2	0. 5. 26, 03	3, 074	2	83. 55. 40, 2	20, 05	
9	3	0. 6. 7, 64	3, 075	4	83. 53. 1, 3	20, 05	
10	2	0. 6. 27, 26	3, 062	2	102. 7. 37, 8	20, 05	
11	2	0. 7. 48, 36	3, 078	2	81. 4. 10, 7	20, 04	
12	3	0. 7. 55, 05	3, 081	3	77. 24. 13, 5	20, 04	
13	9	0. 10. 4, 98	3, 078	4	83. 3. 45, 4	20, 04	
14	3	0. 11. 15, 24	3, 057	3	101. 46. 15, 2	20, 03	
15	5	0. 11. 31, 02	3, 079	3	83. 32. 24, 7	20, 03	
16	5	0. 12. 51, 70	3, 083	0	80. 53. 6, 2	20, 02	
17		0. 12. 59, 06	3, 080		82. 37. 55, 3	20, 02	G. T. Y. C.
18	8	0. 16. 20, 11	3, 086	3	80. 53. 51, 6	20, 00	
19		0. 18. 4, 19	3, 083		83. 7. 38, 7	19, 99	G. T. Y. C.
20	6	0. 19. 15, 30	3, 090	0	80. 40. 13, 1	19, 98	
21	7	0. 19. 16, 66	3, 086	3	82. 15. 26, 1	19, 98	
22	5	0. 20. 41, 25	3, 091	0	80. 37. 9, 9	19, 98	
23	10	0. 22. 53, 10	3, 089	4	82. 18. 21, 1	19, 96	
24	3	0. 23. 29, 59	3, 045	3	100. 54. 9, 7	19, 95	
25	10	0. 25. 49, 85	3, 095	4	81. 2. 46, 2	19, 93	
26	7	0. 30. 27, 62	3, 099	1	80. 59. 5, 4	19, 88	
27	8	1. 28. 15, 53	3, 088	4	88. 1. 35, 9	18, 58	
28		1. 29. 15, 56	3, 173		78. 37. 0, 9	18, 56	G. T. Y. C.
29	5	1. 29. 48, 69	*3, 189		78. 40. 40, 9	18, 54	G. T. Y. C.
30	2	1. 30. 28, 30	3, 159	2	80. 14. 46, 7	18, 51	
31	2	1. 30. 42, 01	3, 088	0	88. 10. 7, 8	18, 51	
32	5	1. 31. 17, 34	3, 102	1	86. 37. 50, 2	18, 48	
33	0	1. 31. 19, 33	3, 178	0	78. 18. 55, 9	18, 48	
34	1	1. 31. 37, 32	3, 162	1	80. 4. 46, 4	18, 47	
35	0	1. 32. 29, 03	3, 174	0	78. 52. 18, 1	18, 44	
36	7	1. 33. 46, 86	3, 174	2	79. 7. 11, 6	18, 40	
37	4	1. 34. 14, 92	3, 089	2	88. 2. 45, 0	18, 39	
38	5	1. 34. 46, 93	3, 161	3	80. 30. 11, 9	18, 36	
39	5	1. 38. 53, 25	3, 090	0	88. 2. 27, 4	18, 22	
40	3	1. 39. 18, 42	3, 170	3	79. 53. 50, 3	18, 21	
41	7	1. 41. 22, 63	3, 157	0	81. 27. 47, 3	18, 13	
42	2	1. 41. 26, 57	3, 161	3	81. 3. 11, 8	18, 12	
43	2	1. 42. 29, 01	3, 163	1	80. 55. 32, 4	18, 08	
44	9	1. 44. 49, 36	3, 163	4	81. 8. 44, 7	17, 99	
45		1. 45. 53, 80	3, 096		87. 32. 42, 0	17, 96	Ed. & Green.
46	6	1. 47. 7, 76	3, 099	0	87. 20. 6, 3	17, 90	
47	7	1. 47. 56, 36	3, 101	5	87. 8. 58, 9	17, 87	
48	6	1. 50. 19, 54	3, 103	1	87. 3. 11, 7	17, 77	
49	9	1. 53. 58, 53	3, 104	4	87. 1. 58, 5	17, 62	
50	6	1. 55. 0, 75	+3, 106	3	86. 52. 8, 6	− 17, 58	

COMPARISON-STARS FOR THE EQUATOREAL.

Reference Number.	Obs. in R. A.	Mean R.A., 1852, 0.	Prec.	Obs. in N.P.D.	Mean N.P.D., 1852, 0.	Prec.	
		h. m. s.	s.		° ′ ″	″	
51		2. 1. 57, 60	+3, 112		86. 28. 13, 5	−17, 29	Edinb.
52	6	2. 3. 12, 53	3. 123	2	85. 37. 1, 3	17, 23	
53	3	2. 3. 51, 13	3, 120	2	85. 55. 57, 9	17, 20	
54	5	2. 4. 17, 71	3, 118	3	86. 6. 28, 7	17, 18	
55	8	2. 5. 32, 86	3, 120	1	85. 56. 44, 5	17, 12	
56	2	2. 5. 45, 65	3, 123	2	85. 40. 51, 5	17, 12	
57	1	2. 6. 1, 16	3, 118	1	86. 9. 40, 3	17, 10	
58	6	2. 7. 15, 62	3, 123	0	85. 49. 23, 4	17, 05	
59	5	2. 8. 3, 32	3, 133	4	85. 2. 26, 1	17, 01	
60	4	2. 10. 51, 60	3, 166	4	82. 30. 18, 2	16, 87	
61	6	2. 18. 28, 65	3, 146	3	84. 22. 33, 3	16, 50	
62	5	2. 19. 4, 42	3, 164	5	83. 2. 41, 9	16, 48	
63	6	2. 19. 16, 89	3, 145	0	84. 26. 20, 2	16, 46	
64	8	2. 21. 8, 43	3, 176	2	82. 17. 7, 6	16, 37	
65	3	2. 25. 8, 19	3, 171	3	82. 46. 5, 5	16. 16	
66		2. 27. 14, 32	3, 166		83. 10. 32, 4	16, 06	Edinb.
67	1	2. 27. 58, 44	*3, 308	1	83. 49. 21, 1	*17, 50	Prop. m.
68		3. 41. 17, 69	2, 573		114. 20. 12, 0	11, 42	G. T. Y. C.
69	6	3. 49. 57, 53	3, 171	3	84. 56. 53, 6	10, 78	
70	5	3. 56. 16, 52	3, 140	3	86. 34. 14, 8	10, 25	
71	1	4. 7. 3, 34	3, 133	1	87. 0. 32, 3	9, 49	
72	1	4. 9. 35, 41	3, 116	1	87. 50. 21, 3	− 9, 30	
73	2	7. 10. 2, 61	3, 335	2	78. 18. 47, 3	+ 6, 03	
74	6	7. 15. 49, 14	3, 321	5	78. 48. 41, 7	6, 51	
75	3	7. 17. 17, 87	4, 415	3	43. 11. 5, 4	6, 63	Durham.
76	7	7. 18. 30, 04	3, 323	5	78. 42. 0, 9	6, 73	
77	7	7. 23. 30, 65	3, 315	5	78. 57. 47, 4	7, 15	
78	6	7. 25. 55, 91	3, 310	4	79. 6. 58, 1	7, 35	
79	6	7. 26. 51, 33	3, 296	4	79. 42. 42, 6	7, 42	
80	5	7. 27. 4, 00	3, 300	3	79. 33. 44, 6	7, 43	
81	6	7. 29. 10, 68	3, 303	3	79. 22. 16, 2	7, 61	
82	6	7. 29. 26, 94	3, 297	3	79. 38. 13, 4	7, 63	
83	6	7. 37. 32, 23	3, 290	5	79. 47. 11, 7	8, 27	
84	8	7. 39. 27, 46	3, 285	5	80. 0. 51, 2	8, 44	
85	6	7. 40. 5, 89	3, 286	4	79. 55. 14, 6	8, 49	
86	2	7. 43. 23, 75	4, 075	2	50. 8. 26, 9	8, 74	Durham.
87	8	7. 49. 22, 29	3, 278	4	80. 7. 23, 2	9, 21	
88	2	7. 53. 41, 15	3, 975	2	52. 27. 17, 2	9, 54	Durham.
89	8	8. 4. 49, 38	3, 273	5	79. 58. 56, 4	10, 39	
90	7	8. 8. 12, 47	3, 268	6	80. 8. 35, 8	10, 64	
91	6	8. 14. 59, 46	3, 321	4	77. 20. 33, 9	11, 14	
92	6	8. 15. 49, 34	3, 289	6	78. 53. 41, 5	11, 19	
93	8	8. 18. 43, 24	3, 295	4	78. 29. 40, 0	11, 41	
94	6	9. 5. 50, 18	3, 513	5	64. 22. 41, 3	14, 54	
95	2	9. 21. 33, 83	3, 474	2	64. 40. 30, 4	15, 45	
96	3	9. 22. 59, 15	3, 467	3	64. 56. 14, 0	15, 53	
97	5	9. 28. 14, 00	3, 454	4	65. 2. 22, 9	15, 81	
98	6	9. 29. 28, 42	3, 447	5	65. 16. 17, 4	15, 89	
99	2	9. 36. 50, 59	3, 422	2	65. 50. 49, 1	16, 26	Durham.
100	6	9. 56. 59, 09	+3, 328	5	69. 22. 5, 4	+17, 24	

COMPARISON-STARS FOR THE EQUATOREAL.

Reference Number.	Obs. in R.A.	Mean R.A., 1852, 0.	Prec.	Obs. in P.P.D.	Mean N.P.D., 1852, 0.	Prec.	
		h. m. s.	s.		° ′ ″	″	
101	6	10. 0. 6,69	+3,307	4	70. 30. 47,1	+17,37	
102	2	10. 1. 0,64	3,303	4	70. 44. 38,6	17,41	
103	4	10. 11. 48,37	*3,322	4	69. 24. 43,4	*18,01	Durham. Prop. m.
104	2	11. 32. 42,56	3,143	4	65. 34. 50,0	19,91	
105	3	11. 45. 14,13	3,111	4	65. 23. 44,0	20,01	
106	4	12. 0. 29,87	3,070	5	65. 28. 26,5	20,05	
107	5	12. 4. 14,08	3,060	5	65. 51. 11,8	20,05	
108		12. 11. 50,50	3,040		66. 8. 32,0	20,03	B. A. C.
109	7	12. 14. 57,06	3,033	5	66. 42. 49,9	20,01	
110	4	12. 17. 3,97	3,029	3	67. 0. 38,3	20,00	
111	0	12. 17. 17,67	3,028	1	66. 48. 33,8	20,00	
112	6	12. 20. 39,15	3,024	5	68. 49. 31,9	19,97	
113	7	12. 22. 55,47	3,015	4	67. 13. 54,1	19,95	
114	1	12. 23. 52,58	3,018	3	68. 57. 24,5	19,95	
115	1	12. 24. 9,52	3,013	3	67. 36. 17,2	19,94	
116	3	12. 24. 44,75	3,014	2	68. 15. 45,6	19,94	
117	6	12. 26. 2,81	3,012	4	68. 44. 47,5	19,93	
118	3	12. 27. 23,90	3,006	3	67. 38. 5,0	19,91	
119	6	12. 29. 24,84	3,005	3	68. 56. 50,5	19,89	
120	3	12. 29. 47,63	3,001	3	67. 59. 8,6	19,88	
121	2	12. 30. 52,36	3,001	3	68. 43. 12,9	19,87	
122	3	12. 31. 13,31	2,999	2	68. 27. 52,3	19,87	
123		12. 31. 45,50	2,997		68. 7. 21,0	19,86	Edinb.
124	0	12. 32. 12,23	3,048	2	83. 4. 9,1	19,86	
125	6	12. 46. 8,99	3,047	5	84. 57. 21,6	19,65	
126		12. 48. 9,16	3,050		85. 47. 50,2	19,62	B. A. C.
127	3	13. 0. 26,29	3,046	3	85. 57. 5,7	19,36	Durham.
128	4	13. 4. 51,25	3,048	4	86. 33. 31,2	19,26	Durham.
129		13. 8. 1,88	3,044		86. 9. 57,5	19,18	
130	8	13. 45. 25,90	2,884	4	72. 32. 14,6	17,97	
131	1	13. 46. 39,53	2,946	1	78. 12. 16,9	17,92	
132	3	13. 47. 35,32	2,777	3	64. 3. 44,5	17,89	
133	6	13. 54. 38,45	2,713	5	60. 52. 23,6	17,60	
134	8	14. 0. 13,52	2,527	4	50. 52. 29,5	17,36	
135	6	14. 16. 43,43	2,349	3	46. 6. 51,7	16,59	
136	3	14. 17. 47,72	2,401	3	48. 28. 58,5	16,54	R. A. by Altona.
137	8	14. 23. 30,05	2,206	5	42. 11. 19,4	16,25	
138	6	14. 26. 45,17	2,061	3	38. 19. 28,1	16,09	
139	6	14. 28. 53,32	2,391	3	49. 55. 25,8	15,97	
140	7	14. 33. 33,66	1,900	3	35. 20. 6,0	15,72	
141	4	14. 34. 50,75	2,356	2	49. 28. 20,4	15,65	
142	2	14. 35. 8,46	1,814	2	33. 39. 31,3	15,64	
143	1	14. 36. 33,10	1,940	1	36. 43. 8,3	15,56	
144		14. 37. 59,83	2,329		48. 54. 44,5	15,48	G. T. Y. C.
145	6	14. 45. 53,14	1,571	5	30. 33. 39,3	15,03	
146	7	14. 50. 33,96	2,215	3	46. 36. 29,8	14,76	
147	7	14. 53. 32,48	1,535	4	30. 52. 41,4	14,58	
148	6	14. 55. 55,52	1,353	3	28. 18. 58,3	14,47	
149		14. 57. 52,89	2,127		44. 46. 29,4	14,32	G. T. Y. C.
150	3	15. 3. 40,82	+3,239	3	99. 56. 42,5	+13,95	

COMPARISON-STARS FOR THE EQUATOREAL.

Reference Number.	Obs. in R.A.	Mean R.A., 1852, 0.	Prec.	Obs. in N.P.D.	Mean N.P.D., 1852, 0.	Prec.	
		h. m. s.	s.		° ′ ″	″	
151	0	15. 4. 36, 02	+2, 063	3	43. 42. 22, 4	+13, 90	
152	3	15. 6. 16, 26	0, 978	3	24. 53. 29, 4	13, 79	
153	2	15. 9. 8, 62	1, 040	2	25. 49. 23, 1	13, 60	
154	6	15. 24. 40, 86	1, 906	5	41. 46. 34, 7	12, 58	
155	2	15. 33. 43, 15	3, 360	2	105. 5. 15, 0	11, 95	
156	3	15. 34. 27, 23	3, 370	4	105. 32. 6, 1	11, 90	
157	3	15. 35. 7, 30	3, 351	3	104. 33. 52, 1	11, 86	
158	6	15. 35. 45, 19	3, 364	6	105. 11. 49, 0	11, 81	
159	3	15. 43. 19, 60	3, 355	3	104. 24. 43, 4	11, 26	
160	6	15. 44. 38, 57	0, 235	2	21. 22. 47, 3	11, 17	
161	2	15. 44. 59, 92	3, 354	2	104. 16. 5, 2	11, 14	
162	3	15. 45. 7, 86	3, 555	3	113. 31. 59, 0	11, 14	
163	3	15. 47. 56, 82	3, 350	3	103. 57. 35, 4	10, 92	
164	3	15. 49. 54, 43	+3, 348	3	103. 50. 54, 6	10, 79	
165	5	15. 54. 23, 31	−0, 047	1	20. 6. 36, 7	10, 45	
166	3	15. 58. 48, 58	+3, 352	3	103. 40. 8, 7	10, 12	
167	3	15. 59. 55, 51	+3, 350	3	103. 32. 11, 0	10, 04	
168	5	16. 38. 36, 45	−0, 946	4	17. 20. 8, 2	6, 97	
169	5	16. 59. 14, 93	−1, 244	4	16. 39. 1, 0	5, 25	
170	2	17. 5. 5, 50	+1, 120	3	33. 38. 31, 0	4, 77	
171	5	17. 40. 4, 14	−1, 602	2	15. 54. 45, 9	+ 1, 75	
172	3	18. 13. 4, 58	+3, 637	3	112. 59. 4, 2	− 1, 13	
173	1	18. 16. 9, 88	+3, 638	1	113. 3. 16, 5	1, 42	
174	3	18. 23. 35, 46	+3, 619	3	112. 23. 37, 2	2, 05	
175	7	19. 6. 26, 13	−1, 159	2	16. 51. 9, 4	5, 74	Altona.
176	3	19. 18. 22, 28	−1, 068	2	16. 55. 14, 7	6, 73	
177	6	19. 20. 31, 25	−0, 900	2	17. 32. 35, 7	6, 90	Altona.
178	3	19. 22. 39, 92	+3, 258	3	98. 29. 25, 0	7, 08	
179	3	19. 24. 55, 99	3, 253	3	98. 18. 29, 5	7, 26	
180	3	19. 27. 30, 36	3, 241	3	97. 46. 45, 4	7, 47	
181		19. 28. 55, 70	3, 230		97. 21. 7, 8	7, 58	B. A. C.
182	3	19. 34. 50, 49	3, 217	3	96. 49. 6, 2	8, 06	
183	10	23. 12. 38, 10	3, 049	4	85. 29. 39, 0	19, 63	
184		23. 12. 48, 00	3, 049		85. 25. 29, 7	19, 63	Edinb.
185	11	23. 19. 47, 72	3, 041	5	82. 44. 51, 4	19, 74	
186		23. 20. 27, 71	3, 048		84. 26. 0, 5	19, 76	G. T. Y. C.
187	6	23. 22. 24, 09	3, 044	0	82. 59. 43, 5	19, 78	
188	3	23. 22. 50, 21	3, 050	2	84. 23. 21, 8	19, 79	
189	1	23. 23. 23, 59	3, 044	1	82. 49. 7, 3	19, 80	
190	3	23. 23. 24, 99	3, 038	1	81. 19. 55, 8	19, 80	
191	6	23. 24. 41, 36	3, 048	1	83. 43. 45, 7	19, 82	Durham
192	6	23. 25. 54, 70	3, 039	2	80. 46. 53, 3	19, 83	
193	4	23. 26. 19, 87	3, 053	0	84. 51. 5, 7	19, 84	
194	9	23. 27. 41, 64	3, 032	2	78. 9. 13, 3	19, 85	
195	2	23. 28. 43, 00	3, 052	0	83. 57. 24, 1	19, 87	
196	3	23. 28. 43, 70	3, 040	2	80. 18. 44, 2	19, 87	
197	7	23. 29. 15, 96	3, 055	0	84. 54. 5, 2	19, 87	
198	2	23. 29. 27, 51	3, 039	1	79. 48. 12, 9	19, 88	
199	3	23. 30. 31, 89	3, 034	0	77. 56. 18, 9	19, 89	
200	3	23. 31. 23, 37	+3, 037	2	78. 37. 27, 9	−19, 90	

COMPARISON-STARS FOR THE EQUATOREAL.

Reference Number.	Obs. in R.A.	Mean R.A., 1852, 0.	Prec.	Obs. in N.P.D.	Mean N.P.D., 1852, 0.	Prec.	
		h, m. s.	s.		° ′ ″	″	
201	2	23. 31. 49,81	+3,039	1	79. 2.41,1	−19,90	
202		23. 32. 20,33	*3,085		85.10.31,8	*19,47	Naut. Alm.
203	4	23. 32. 22,72	3,046	2	81. 8.30,1	19,91	
204	5	23. 34. 24,45	3,054	0	83.34. 5,2	19,93	
205	8	23. 34. 29,82	3,040	2	78. 4.33,3	19,93	
206	4	23. 35. 50,62	3,047	0	80.29.25,5	19,94	
207	12	23. 37. 49,41	3,050	4	80.38.28,6	19,96	
208	7	23. 39. 28,14	3,062	0	85.34.18,7	19,97	
209		23. 45. 4,41	3,055		79.52.32,6	20,01	Edinb.
210	11	23. 45. 26,59	3,054	3	78.53.50,5	20,01	
211	6	23. 47. 1,30	3,052	0	76.13.26,8	20,02	
212	7	23. 48. 3,76	3,062	3	82.35.59,7	20,03	
213	5	23. 48. 52,81	3,059	0	79.31.51,6	20,03	
214	5	23. 49. 25,96	3,060	3	79.36.17,1	20,03	
215	6	23. 50. 12,32	3,060	0	79.20.55,8	20,04	
216	3	23. 56. 55,41	3,074	2	101.20. 1,1	20,05	
217		23. 58. 6,36	3,068		77.25.37,6	20,05	Edinb.
218	7	23. 58. 24,09	3,069	0	77.56.56,1	20,05	
219	3	23. 59. 29,37	3,071	2	83.56.50,4	20,05	
220	1	23. 59. 48,99	3,071	1	101.51.26,2	20,05	
221	2	23. 59. 57,09	+3,071	2	101.31.36,9	−20,05	

DIFFERENTIAL OBSERVATIONS

OF THE SMALL PLANETS, AND COMETS,

TAKEN WITH THE FRAUNHOFER EQUATOREAL,

IN 1850, 1851, AND 1852.

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	C. — O.	Apparent N.P.D.	C. — O.
	h. m. s.	h. m. s.	s.	° ′ ″	″
	1850. JUNO.				
1	May 1..13. 14. 15	13. 3. 50, 59	+ 3, 09	86. 25. 14, 7	+ 14, 6
2	2..14. 30. 57	13. 3. 12, 28	+ 3, 52	86. 20. 27, 6	+ 13, 3
3	6..12. 14. 12	13. 1. 1, 86	+ 2, 54	86. 4. 17, 7	+ 15, 1
	1850. IRIS.				
1	May 4..14. 38. 20	15. 44. 36, 37	+ 0, 34	113. 29. 37, 2	+ 0, 8
2	5..13. 42. 41	15. 43. 41, 57	+ 0, 66	113. 25. 54, 3	− 2, 2
	1850. PETERSEN'S COMET.				
1	May 9..12. 54. 35	19. 13. 25, 00	+ 2, 25	17. 29. 50, 4	+ 42, 4
2	12..10. 52. 40	19. 6 35, 40	− 2, 21	17. 3. 17, 5	17, 8
3	12..11. 31. 15	19. 6. 32, 55	3, 63	17. 3. 4, 9	16, 1
4	14..13. 26. 24	19. 0. 32, 74	2, 32		
5	14..13. 26. 10	19. 0. 33, 81	3, 36	16. 45. 0, 7	20, 7
6	15..11. 53. 13	18. 57. 34, 10	3, 04	16. 37. 32, 1	9, 6
7	29..12. 46. 26	17. 47. 17, 17	1, 31	15. 46. 43, 0	20, 1
8	June 4..11. 54. 22	17. 4. 17, 46	− 0, 63	16. 34. 23, 5	26, 1
9	7..13. 24. 20	16. 40. 46, 21	+ 5, 12	17. 26. 17, 8	+ 4, 1
10	13..12. 23. 56	15. 56. 21, 75	1, 14	20. 15. 8, 3	− 17, 2
11	15..12. 19. 10	15. 42. 27, 06	3, 97	21. 34. 55, 2	+ 0, 8
12	19..13. 17. 30	15. 16. 46, 27	0, 09	24. 59. 35, 6	− 6, 4
13	20..12. 28. 3	15. 11. 8, 96	2, 35	25. 57. 43, 7	7, 3
14	22..12. 38. 30	15. 0. 5, 60	1, 36	28. 11. 3, 4	7, 4
15	24..12. 47. 13	14. 49 51, 78	2, 15	30. 42. 25, 8	11, 5
16	24..13. 21. 28	14. 49. 45, 34	1, 61	30. 44. 12, 9	4, 0
17	26..13. 43. 11	14. 40. 19, 61	1, 36	33. 36. 15, 7	11, 5
18	27..13. 28. 36	14. 35. 58, 82	1, 33	35. 8. 20, 3	6, 3
19	28..13. 49. 9	14. 31. 43, 32	0, 84	36. 48. 23, 0	14, 1
20	29..12. 46. 1	14. 27. 52, 34	+ 0, 60	38. 27. 50, 3	9, 1
21	July 1..12. 43. 32	14. 20. 20, 32	− 0, 75	42. 12. 51, 9	9, 6
22	3..11. 25. 7	14. 13. 34, 35	+ 0, 05	46. 14. 47, 0	7, 8
23	4..11. 35. 26	14. 10. 18, 41	− 0, 72	48. 28. 59, 0	7, 9
24	5..11. 45. 52	14. 7. 9, 23	+ 0, 07	50, 49. 13, 9	8, 2
25	9..10. 56. 33	13. 56. 1, 09	− 0, 11	60. 55. 47, 9	2, 8
26	10..13. 31. 18	13. 53. 13, 49	− 0, 28	63. 58. 37, 6	5, 3
27	13..11. 57. 55	13. 46. 23, 21	− 0, 20	72. 21. 47, 8	− 1, 4
28	15..11. 20. 36	13. 42. 12, 17	+ 0, 20	78. 7. 52, 5	0, 0
	1850. FLORA.				
1	Sept.30..11. 32. 58	0. 16. 54, 28	+ 3, 35	101. 6. 50, 0	− 17, 6
2	Oct. 8..11. 31. 24	0. 10. 12, 08	2, 93	101. 48. 8, 0	17, 0
3	9..12. 39. 26	0. 9. 23, 14	2, 94	101. 52. 6, 2	17, 1
4	14..14. 8. 11	0. 5. 45, 86	+ 2, 75	102. 6. 13, 2	− 15, 9
5	28..11. 4. 14	23. 59. 26, 46		102. 0. 50, 1	
6	29.. 9. 56. 57	23. 59. 14, 17		101. 58. 16, 6	
7	Nov. 5..10. 15. 22	23. 58. 41, 74		101. 30. 17, 5	
8	5..11. 0. 41	23. 58. 41, 13		101. 30. 6, 8	
9	8..11. 37. 4	23. 58. 59, 90		101. 13. 44, 1	
10	21..11. 24. 18	0. 3. 50, 53		99. 38. 4, 7	

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps.	Apparent N.P.D.	Comps.
		h. m. s.		° ′ ″	
		For Juno.			
1	128	13. 4. 46, 52	12	86. 32. 57, 9	4
2	129	13. 7. 57, 17	12	86. 9. 24, 0	4
3	127	13. 0. 24, 54	26	85. 56. 31, 8	9
		For Iris.			
1	162	15. 45. 2, 57	4	113. 31. 35, 8	3
2	162	2, 58	15	35, 9	5
		For Comet.			
1	177	19. 20. 35, 73	3	17. 32. 59, 8	1
2	175	19. 6. 31, 55	8	16. 51. 29, 9	5
3	176	19. 18. 27, 41	7	16. 55. 37, 8	2
4	175	19. 6. 31, 65	6		0
5	176	19. 18. 27, 53	7	16. 55. 37, 4	2
6	175	19. 6. 31, 73	10	16. 51. 29, 2	3
7	171	17. 40. 11, 68	11	15. 54. 40, 6	4
8	169	16. 59. 21, 50	5	16. 38. 44, 8	1
9	168	16. 38. 42, 12	3	17. 19. 46, 5	1
10	165	15. 54. 26, 29	6	20. 6. 4, 1	6
11	160	15. 44. 40, 72	19	21. 22. 12, 4	4
12	152	15. 6. 16, 24	10	24. 52. 47, 3	2
13	153	15. 9. 8, 41	23	25. 48. 41, 4	5
14	148	14. 55. 54, 42	15	28. 18. 14, 8	3
15	145	14. 45. 51, 43	25	30. 32. 54, 0	5
16	147	14. 53. 30, 91	9	30. 51. 57. 2	2
17	142	14. 35. 6, 09	15	33. 38. 44, 9	3
18	140	14. 33. 31, 08	30	35. 19. 19, 6	6
19	143	14. 36. 30, 39	10	36. 42. 22, 3	2
20	138	14. 26. 42, 17	28	38. 18. 41, 0	6
21	137	14. 23. 26, 71	32	42. 10. 32, 6	7
22	135	14. 16. 39, 77	25	46. 6. 4, 7	5
23	136	14. 17. 43, 92	23	48. 28. 12, 4	5
24	134	14. 0. 9, 36	28	50. 51. 42, 3	6
25	133	13. 34. 33, 92	40	60. 51. 38, 4	8
26	132	13. 47. 30, 65	12	64. 2. 59, 7	3
27	130	13. 45. 21, 04	30	72. 31. 32, 2	8
28	131	13. 46. 34, 59	15	78. 11. 36, 3	5
		For Flora.			
1	24	0. 23. 26, 15	3	100. 54. 32, 8	1
2	14	0. 11. 11, 80	24	101. 46. 38, 8	8
3	14	11, 81	15	38, 9	5
4	10	0. 6. 23, 81	16	102. 8. 2, 0	8
5	2	0. 0. 10, 55	24	101. 57. 31, 7	8
6	220	23. 59. 45, 44	16	101. 51. 51, 6	8
7	216	23. 56. 51, 79	24	101. 20. 27, 0	8
8	221	23. 59. 53, 49	23	101. 32. 2, 9	8
9	216	23. 56. 51, 77	9	101. 20. 27, 3	3
10	3	0. 0. 39, 97	7	97. 39. 15, 2	3

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	C. — O.	Apparent N P.D.	C. — O.
	h. m. s.	h. m. s.	s.	° ′ ″	″
	1850. Victoria.				
1	Sept. 16. . 15. 34. 39	23. 42. 7, 91	−0, 02	76. 20. 48, 9	− 0, 2
2	17. . 12. 10. 56	23. 41. 25, 22	+0, 16	76. 28. 43, 5	+ 0, 5
3	26. . 9. 23. 5	23. 34. 22, 57	0, 13	77. 58. 52, 0	+ 0, 9
4	26. . 10. 24. 41	23. 34. 20, 72	0, 08	77. 59. 18, 6	+ 2, 0
5	28. . 9. 51. 27	23. 32. 54, 45	0, 08	78. 20. 50, 9	+ 1, 1
6	30. . 8. 59. 38	23. 31. 32, 64	0, 26	78. 42. 32, 3	− 0, 6
7	Oct. 1. . 10. 25. 57	23. 30. 50, 54	0, 18	78. 54. 18, 3	− 0, 6
8	5. . 8. 24. 44	23. 28. 27, 57	0, 32	79. 37. 54, 4	− 0, 9
9	8. . 10. 3. 33	23. 26. 51, 62	0, 28	80. 11. 47, 0	− 0, 4
10	9. . 8. 11. 22	23. 26. 25, 79	0, 28	80. 21. 55, 3	(− 5, 3)
11	11. . 10. 52. 19	23. 25. 32, 19	+0, 12	80. 44. 36, 3	+ 0, 2
12	14. . 8. 45. 18	23. 24. 31, 32	−0, 20	81. 15. 10, 4	− 0, 4
13	14. . 11. 33. 59	23. 24. 28, 93	+0, 05	81. 16. 19, 9	+ 2, 4
14	23. . 10. 52. 38	23. 23. 0, 66	+0, 01	82. 41. 53, 8	+ 1, 8
15	23. . 11. 51. 53	23. 23. 0, 85	−0, 24	82. 42. 13, 6	+ 3, 4
16	26. . 13. 26. 57	23. 23. 5, 50	−0, 44	83. 7. 52, 1	+ 2, 5
17	28. . 8. 5. 13	23. 23. 15, 44	+0, 15	83. 21. 48, 8	+ 0, 3
18	29. . 8. 5. 55	23. 23. 23, 87	+0, 21	83. 29. 20, 6	− 0, 4
19	30. . 7. 57. 16	23. 23. 33, 92	+0, 40	83. 36. 35, 2	− 0, 4
20	Nov. 2. . 10. 18. 52	23. 24. 17, 73	−0, 05	83. 57. 37, 2	+ 3, 2
21	4. . 10. 47. 38	23. 24. 55, 33	0, 19	84. 10. 8, 2	3, 1
22	5. . 8. 2. 43	23. 25. 14, 09	0, 27	84. 15. 19, 8	2, 0
23	8. . 9. 36. 41	23. 26. 29, 43	0, 64	84. 31. 45, 5	2, 6
24	12. . 11. 11. 38	23. 28. 32, 55	0, 45	84. 50. 0, 1	4, 7
25	12. . 12. 0. 12	23. 28. 33, 79	0, 32	84. 50. 4, 7	(+ 8, 2)
26	14. . 7. 17. 48	23. 29. 36, 87	0, 54	84. 57. 0, 1	1, 7
27	16. . 8. 23. 6	23. 30. 53, 90	0, 12	85. 3. 46, 0	3, 7
28	21. . 8. 32. 27	23. 34. 28, 87	0, 58	85. 16. 21, 4	2, 6
29	27. . 10. 16. 21	23. 39. 33, 16	0, 83	85. 24. 10, 2	4, 3
30	28. . 9. 59. 7	23. 40. 26, 50	−0, 47	85. 24. 42, 5	+ 4, 6
	1850, 51. Metis.				
1	Dec. 23. . 15. 36. 58	10. 2. 50, 37		70. 35. 19, 2	
2	27. . 14. 27. 31	10. 3. 17, 39		70. 19. 50, 9	
3	Jan. 6. . 13. 29. 16	10. 1. 58, 08		69. 29. 6, 9	
4	7. . 14. 38. 17	10. 1. 37, 96		69. 22. 50, 9	
5	Feb. 8. . 10. 50. 11	9. 36. 37, 13	−3, 48	65. 49. 21, 8	+ 6, 4
6	8. . 12. 28. 51	9. 36. 32, 76	3, 42		
7	14. . 13. 23. 5	9. 30. 16, 43	3, 69	65. 17. 30, 4	+ 3, 5
8	16. . 14. 50. 40	9. 28. 10, 77	3, 30	65. 8. 18, 1	5, 8
9	17. . 10. 45. 36	9. 27. 21, 50	3, 68	65. 4. 52, 3	4, 8
10	17. . 11. 44. 15	9. 27. 18, 68	3, 28	65. 4. 35, 4	(+ 11, 8)
11	20. . 13. 31. 8	9. 24. 20, 06	3, 50	64. 53. 12, 4	6, 8
12	21. . 12. 54. 37	9. 23. 25, 39	3, 60	64. 49. 59, 8	6, 7
13	23. . 12. 47. 51	9. 21. 36, 24	−3, 27	64. 44. 6, 0	+ 5, 5
14	Mar. 4. . 9. 11. 30	9. 14. 41, 31		64. 28. 29, 0	
15	10. . 12. 19. 29	9. 11. 11, 49		64. 27. 36, 8	

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps.	Apparent N.P.D.	Comps.	
		h. m. s.		° ′ ″		
		For Victoria.				
1	211	23. 46. 57, 97	18	76. 13. 49, 8*	6	
2	211	57, 98	15	49, 7*	5	
3	205	23. 34. 26, 51	10	78. 4. 54, 5	10	
4	199	23. 30. 28, 59	11	77. 56. 39, 9*	4	
5	194	23. 27. 38, 34	15	78. 9. 33, 9	5	
6	200	23. 31. 20, 06	16	78. 37. 48, 6	8	
7	201	23. 31. 46, 49	14	79. 3. 1, 7	5	
8	198	23. 29. 24, 17	24	79. 48. 33, 2	8	
9	196	23. 28. 40, 33	15	80. 19. 4, 3	5	
10	206	23. 35. 47, 27	15	80. 29. 46, 0*	5	
11	192	23. 25. 51, 30	8	80. 47. 13, 3	8	
12	190	23. 23. 21, 58	24	81. 20. 15, 5	8	
13	203	23. 32. 19, 33	24	81. 8. 50, 2	8	
14	189	23. 23. 20, 10	8	82. 49. 27, 1	8	
15	185	23. 19. 44, 22	12	82. 45. 11, 0	4	
16	187	23. 22. 20, 57	18	83. 0. 3, 3*	6	
17	204	23. 34. 20, 94	15	83. 34. 25, 7*	5	
18	191	23. 24. 37, 81	24	83. 44. 5, 7	8	
19	191	37, 80	24	5, 7	8	
20	195	23. 28. 39, 43	24	83. 57. 44, 4*	8	
21	188	23. 22. 46, 59	8	84. 23. 42, 1	8	An asterisk placed against a star in either element indicates that that element has not been recently observed.
22	186	23. 20. 24, 07	24	84. 26. 20, 6	8	
23	186	24, 04	11	20, 7	4	
24	197	23. 29. 12, 28	24	84. 54. 26, 0*	8	
25	193	23. 26. 16, 17	18	84. 51. 26, 5*	6	
26	197	23. 29. 12, 26	14	84. 54. 26, 1*	8	
27	202	23. 32. 16, 58	23	85. 10. 52, 7	8	
28	202	16, 53	24	52, 9	8	
29	208	23. 39. 24, 33	12	85. 34. 40, 9*	6	
30	208	24, 32	23	41, 0*	8	
		For Metis.				
1	102	10. 0. 56, 90	18	70. 44. 25, 0	6	
2	101	10. 0. 3, 15	24	70. 30. 34, 2	8	
3	103	10. 11. 45, 05	12	69. 24. 31, 0	4	
4	100	9. 56. 55, 85	18	69. 21. 54, 1	6	
5	99	9. 36. 47, 92	18	65. 50. 39, 9	8	
6						Transit circle.
7	98	9. 29. 25, 79	24	65. 16. 7, 9	8	
8	98	25, 79	21	7, 9	7	
9	97	9. 28. 11, 37	24	65. 2. 13, 7	8	
10						Transit circle.
11	96	9. 22. 56, 51	24	64. 56. 4, 8	8	
12	96	56, 51	16	4, 8	8	
13	95	9. 21. 31, 19	11	64. 40. 21, 0	4	
14	94	9. 5. 47, 43	14	64. 22. 31, 9	5	
15	94	47, 40	24	31, 4	8	

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	C. — O.	Apparent N.P.D.	C. — O.
	h. m. s.	h. m. s.	s.	° ′ ″	″
	1851. HEBE.				
1	June 17.. 13. 7. 48	19. 38. 50, 25		96. 53. 42, 2	
2	26.. 12. 56. 57	19. 32. 45, 57	−1, 07	97. 29. 2, 8	− 3, 3
3	27.. 13. 7. 51	19. 31. 58, 07	1, 12	97. 34. 6, 8	0, 8
4	29.. 12. 39. 7	19. 30. 21, 10	1, 00	97. 41. 52, 9	4, 5
5	30.. 12. 9. 1	19. 29. 31, 67	1, 01	97. 50. 29, 4	3, 9
6	July 4.. 13. 0. 44	19. 25. 58, 36	0, 98	98. 15. 49, 8	1, 5
7	6.. 10. 47. 20	19. 24. 12, 95	−0, 80	98. 29. 4, 7	− 4, 3
	1851. IRIS.				
1	Sept. 9.. 10. 59. 2	0. 4. 59, 52	+1, 23	77. 32. 38. 4	− 7, 9
2	9.. 12. 16. 4	0. 4. 57, 51	1, 09	77. 32. 41, 8	5, 1
3	10.. 11. 37. 6	0. 4. 17, 90	1, 07	77. 34. 40, 4	3, 8
4	13.. 11. 18. 12	0. 2. 9, 05	1, 56	77. 42. 32, 7	5, 6
5	13.. 11. 57. 17	0. 2. 8, 09	1, 31	77. 42. 36, 7	4, 7
6	15.. 10. 59. 47	0. 0. 39, 09	1, 19	77. 49. 7, 0	3, 3
7	28.. 10. 1. 19	23. 50. 2, 52	1, 49	78. 56. 45, 0	5, 7
8	Oct. 2.. 10. 11. 52	23. 46. 50, 48	1, 51	79. 24. 22, 2	5, 7
9	2.. 10. 52. 0	23. 46. 49, 09	1, 60	79. 24. 32, 9	4, 4
10	4.. 9. 56. 34	23. 45. 19, 64	1, 64	79. 38. 49, 3	5, 4
11	6.. 9. 9. 9	23. 43. 54, 00	1, 57	79. 53. 28, 0	5, 1
12	12.. 9. 49. 24	23. 40. 2, 58	+1, 35	80. 39. 26, 2	− 2, 4
	1851. HYGEIA.				
1	Sept. 13.. 12. 38. 17	0. 20. 42, 83	−1, 67	82. 8. 42, 2	+11, 2
2	15.. 12. 19. 27	0. 19. 20, 19	1, 30	82. 16. 7, 9	8, 1
3	21.. 13. 16. 10	0. 15. 1, 16	1, 42	82. 40. 32, 8	10, 2
4	27.. 13. 3. 23	0. 10. 37, 35	1, 17	83. 7. 10, 9	9, 6
5	28.. 10. 52. 33	0. 9. 57, 14	0, 93	83. 11. 22, 5	9, 3
6	Oct. 2.. 12. 1. 58	0. 7. 1, 08	1, 12	83. 30. 19, 3	8, 7
7	6.. 9. 54. 52	0. 4. 14, 91	0, 71	83. 48. 49, 8	10, 1
8	7.. 10. 30. 43	0. 3. 32, 70	0, 86	83. 53. 41, 7	9, 5
9	7.. 11. 55. 58	0. 3. 30, 45	1, 05	83. 53. 58, 3	9, 7
10	8.. 10. 16. 27	0. 2. 52, 43	1, 06	83. 58. 20, 6	11, 7
11	10.. 12. 43. 31	0. 1. 28, 16	0, 97	84. 8. 16, 7	9, 2
12	12.. 10. 50. 5	0. 0. 13, 40	−0, 77	84. 17. 16, 3	+ 7, 2
	1851. PALLAS.				
1	Oct. 26.. 13. 14. 35	3. 40. 45, 44	−1, 59	114. 6. 13, 9	−27, 1
2	27.. 13. 2. 49	3. 40. 9, 11	−1, 77	114. 22. 43, 7	−27, 4
	1851. PARTHENOPE.				
1	Aug. 28.. 12. 17. 15	2. 19. 22, 68	+4, 72	82. 28. 43, 4	−25, 6
2	30.. 12. 15. 51	2. 19. 55, 42	4, 46	82. 32. 17, 2	27, 4
3	Sept. 5.. 12. 52. 12	2. 20. 49, 68	5, 81	82. 46. 31, 8	25, 5
4	6.. 13. 45. 56	2. 20. 52, 53	6, 06	82. 49. 32, 1	26, 3
5	9.. 13. 22. 22	2. 20. 50, 41	6, 23	82. 58. 58, 7	24, 7
6	11.. 13. 0. 38	2. 20. 39, 95	6, 43	83. 6. 1, 2	27, 9
7	13.. 13. 36. 23	2. 20. 21, 76	6, 77	83. 13. 43, 1	28, 8
8	21.. 14. 35. 22	2. 17. 56, 79	+7, 48	83. 49. 19, 0	−28, 7

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps.	Apparent N.P D.	Comps
		h. m. s.		° ′ ″	
		For Hebe.			
1	182	19. 34. 49, 04	15	96. 49. 8, 1	5
2	181	19. 28. 54, 34	24	97. 21. 8, 2	8
3	181	54, 35	24	8, 1	8
4	180	19. 27. 29, 04	24	97. 46. 45, 3	8
5	180	29, 06	24	45, 2	8
6	179	19. 24. 54, 74	24	98. 18. 28, 7	8
7	178	19. 22. 38, 70	24	98. 29. 23, 9	8
		For Iris.			
1	12	0. 7. 54, 43	24	77. 24. 19, 4	8
2	217	23. 58. 5, 76	15	77. 25. 43, 3	5
3	217	5, 77	18	43, 1	6
4	7	0. 3. 42, 51	24	77. 46. 4, 2	8
5	1	0. 0. 5, 60	24	77. 44. 29, 8	8
6	218	23. 58. 23, 54	24	77. 57. 1, 0*	8
7	210	23. 45. 26, 10	18	78. 53. 53, 5	6
8	215	23. 50. 11, 83	24	79. 21. 58, 6*	8
9	213	23. 48. 52, 32	24	79. 31. 54, 3*	8
10	214	23. 49. 25, 47	9	79. 36. 19, 7	3
11	209	23. 45. 3, 92	24	79. 52. 35, 0	8
12	207	23. 37. 48, 88	24	80. 38. 28, 0	8
		For Hygeia.			
1	21	0. 19. 16, 02	24	82. 15. 31, 3	8
2	23	0. 22. 52, 47	12	82. 18. 26, 2	4
3	17	0. 12. 58, 50	24	82. 37. 59, 5	8
4	13	0. 10. 4, 45	18	83. 3. 49, 1	8
5	19	0. 18. 3, 67	18	83. 7. 42, 5	6
6	15	0. 11. 30, 51	6	83. 32. 28, 1	2
7	9	0. 6. 7, 13	9	83. 53. 4, 5	3
8	8	0. 5. 25, 53	24	83. 55. 43, 4	8
9	219	23. 59. 28, 86	21	83. 56. 53, 5	7
10	5	0. 0. 56, 23	16	84. 2. 29, 2	6
11	4	0. 0. 49, 23	24	84. 12. 29, 5*	8
12	4	49, 23	24	29, 4*	8
		For Pallas.			
1	68	3. 41. 17, 60	10	114. 20. 11, 7	5
2	68	17, 62	24	11, 8	8
		Parthenope.			
1	64	2. 21. 7, 01	18	82. 17. 15, 1	6
2	60	2. 10. 50, 29	12	82. 30. 25, 5	4
3	65	2. 25. 6, 96	15	82. 46. 11, 8	5
4	65	6, 98	15	11, 7	5
5	62	2. 19. 3, 31	24	83. 2. 47, 8	8
6	66	2. 27. 13, 22	18	83. 10. 37, 9	6
7	66	13, 26	15	37, 8	5
8	67	2. 27. 57, 41	9	83. 49. 26, 1	3

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	C. — O.	Apparent N.P.D.	C. — O.
	h. m. s.	h, m. s.	s.	° ′ ″	″
	1851. PARTHENOPE *continued.*				
9	Sept. 27.. 14. 34. 29	2 14. 55, 26	+ 8, 02	84. 20. 24, 3	− 28, 0
10	28.. 15. 13. 58	2. 14. 18, 47	8, 01	84. 25. 55, 1	21, 0
11	Oct. 4.. 14. 32. 55	2. 10. 14, 88	7, 91	84. 59. 52, 6	22, 0
12	11.. 14. 11. 17	2. 4. 36, 11	8, 27	85. 40. 48, 8	21, 9
13	11.. 14. 44. 32	2. 4. 35, 03	8, 15	85. 41. 1, 0	25, 9
14	13.. 10. 36. 6	2. 2. 59, 29	8, 15	85. 51. 35, 7	21, 8
15	13.. 11. 14. 49	2. 2. 57, 78	8, 23	85. 51. 45, 0	21, 8
16	13.. 12. 0. 40	2. 2. 56, 20	8, 13	85. 51. 56, 0	21, 6
17	15.. 12. 19. 56	2. 1. 8, 03	8, 23	86. 3. 31, 5	21, 3
18	16.. 10. 13. 54	2. 0. 18, 39	8, 20	86. 8. 41, 6	19, 8
19	16.. 11. 11. 47	2. 0. 16, 29	8, 10	86. 8. 51, 4	19, 0
20	19.. 12. 7. 47	1. 57. 28, 73	7, 91	86. 25. 47, 7	17, 3
21	23.. 10. 32. 59	1. 53. 49, 36	7, 83	86. 46. 34, 5	18, 3
22	26.. 9. 36. 4	1. 51. 5, 70	7, 28	87. 1. 2, 7	14, 4
23	26.. 10. 21. 16	1. 51. 3, 89	7, 36	87. 1. 12, 8	15, 6
24	27.. 10. 12. 36	1. 50. 9, 23	7, 49	87. 5. 50, 1	15, 4
25	28.. 10. 24. 16	1. 49. 14, 53	7, 34	87. 10. 22, 3	14, 5
26	31.. 9. 21. 27	1. 46. 37, 27	7, 07	87. 22. 45, 6	8, 6
27	Nov. 2.. 10. 5. 35	1. 44. 52, 71	7, 01	87. 30. 35, 2	11, 3
28	3.. 8. 54. 26	1. 44. 4, 85	7, 06	87. 33. 59, 0	10, 9
29	4.. 10. 46. 31	1. 43. 12, 01	6, 70	87. 37. 39, 9	11, 5
30	12.. 10. 36. 2	1. 37. 18, 16	5, 87	87. 58. 8, 0	7, 1
31	13.. 11. 27. 48	1. 36. 38, 03	5, 92	87. 59. 53, 3	6, 4
32	18.. 9. 29. 18	1. 33. 49, 25	5, 53	88. 5. 21, 7	7, 2
33	22.. 12. 16. 6	1. 31. 56, 44	5, 49	88. 6. 12, 3	7, 6
34	24.. 8. 4. 42	1. 31. 15, 55	5, 19	88. 5. 30, 0	8, 4
35	24.. 11. 35. 9	1. 31. 12, 52	5, 17	88. 5. 22, 8	6, 4
36	25.. 11. 55. 20	1. 30. 52, 22	5, 25	88. 4. 41, 9	8, 5
37	27.. 8. 48. 34	1. 30. 19, 40	5, 36	88. 2. 50, 9	8, 6
38	27.. 10. 18. 43	1. 30. 18, 52	5, 25	88. 2. 46, 7	8, 8
39	28.. 10. 32. 30	1. 30. 3, 55	5, 14	88. 1. 29, 9	9, 5
40	Dec. 22.. 8. 43. 55	1. 32. 20, 90	+ 5, 31	86. 39. 54, 1	− 20, 9
	1852. ENCKE'S COMET.				
1	Jan. 17.. 6. 41. 16	23. 11. 14, 94	+ 0, 63	85. 28. 9, 0	+ 52, 3
2	17.. 7. 32. 12	23. 11. 17, 86	0, 40	85. 28. 11, 0	+ 37, 5
3	Feb. 8.. 7. 5. 16	23. 44. 55, 90	0, 73	82. 41. 59, 4	+ 6, 9
4	9.. 6. 55. 20	23. 46. 42, 76	0, 62	82. 33. 30, 2	+ 3, 7
5	18.. 7. 3. 32	0. 3. 37, 49	1, 41	81. 19. 43, 5	− 17, 1
6	19.. 7. 21. 35	0. 5. 34, 17	2, 36	81. 12. 28, 0	18, 8
7	21.. 7. 16. 28	0. 9. 25, 49	2, 78	80. 59. 32, 3	30, 4
8	22.. 7. 7. 41	0. 11. 19, 80	3, 12	80. 53. 54, 5	35, 9
9	23.. 7. 11 52	0. 13. 13, 90	3, 69	80. 48. 52, 6	40, 7
10	24.. 7. 12. 57	0. 15. 6, 45	4, 03	80. 44. 39, 7	45, 9
11	28.. 7. 27. 32	0. 22. 7, 17	7, 30	80. 39. 10, 3	83, 2
12	Mar. 2.. 7. 46. 1	0. 26. 24, 22	9, 94	80. 53. 41, 1	138, 8
13	3.. 7. 15. 6	0. 27. 27, 01	+12, 89	81. 3. 23, 3	−156, 2

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps.	Apparent N.P.D.	Comps.
		h. m. s.		° ′ ″	
	For	PARTHENOPE.			
9	61	2. 18. 27, 90	24	84. 22. 37, 5	8
10	63	2. 19. 16, 16	15	84. 26. 24, 4*	5
11	59	2. 8. 2, 72	8	85. 2. 28, 6	3
12	56	2. 5. 45, 15	24	85. 40. 55, 2	8
13	52	2. 3. 12, 03	24	85. 37. 5, 0	8
14	53	2. 3. 50, 66	24	85. 56. 1, 6	8
15	58	2. 7. 15, 15	24	85. 49. 27, 0*	8
16	55	2. 5. 32, 39	24	85. 56. 48, 1	8
17	54	2. 4. 17, 24	24	86. 6. 32, 3	8
18	54	17, 25	24	32, 4	8
19	57	2. 6. 0, 71	18	86. 9. 43, 9	6
20	51	2. 1. 57, 19	12	86. 28. 17, 2	4
21	50	1. 55. 0, 37	24	86. 52. 12, 4	8
22	48	1. 50. 19, 18	24	87. 3. 15, 6	8
23	49	1. 53. 58, 17	24	87. 2. 2, 3	8
24	47	1. 47. 56, 00	24	87. 9. 2, 8	8
25	47	56, 01	24	2, 8	8
26	46	1. 47. 7, 42	8	87. 20. 10, 3*	4
27	45	1. 45. 53, 47	24	87. 32. 46, 2	8
28	45	53, 47	24	46, 2	8
29	45	53, 47	21	46, 2	7
30	39	1. 38. 52, 92	24	88. 2. 32, 0*	8
31	37	1. 34. 14, 58	24	88. 2. 49, 7	8
32	37	14, 56	16	50, 0	8
33	37	14, 55	15	50, 3	5
34	37	14, 55	24	50, 4	8
35	31	1. 30. 41, 62	16	88. 10. 13, 2*	8
36	27	1. 28. 15, 13	9	88. 1. 41, 3	3
37	27	15, 12	21	41, 5	7
38	37	1. 34. 14, 54	24	88. 2. 50, 6	8
39	27	1. 28. 15, 12	24	88. 1. 41, 6	8
40	32	1. 31. 16, 76	24	86. 37. 57, 1	8
		For COMET.			
1	184	23. 12. 46, 40	6	85. 25. 36, 8	6
2	183	23. 12. 36, 50	6	85. 29. 46, 1	6
3	212	23. 48. 2, 16	9	82. 36. 8, 2	3
4	212	2, 15	24	8, 3	8
5	6	0. 1. 36, 63	18	81. 12. 53, 9*	6
6	11	0. 7. 46, 76	10	81. 4. 19, 7	5
7	11	46, 75	24	19, 8	8
8	16	0. 12. 50, 10	24	80. 53. 15, 3*	8
9	18	0. 16. 18, 51	18	80. 54. 0, 8	6
10	20	0. 19. 13, 71	18	80. 40. 22, 3*	6
11	22	0. 20. 39, 64	14	80. 37. 19, 3*	5
12	25	0. 25. 48, 24	12	81. 2. 55, 9	6
13	26	0. 30. 26, 02	12	80. 59. 15, 1	4

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	C. — O.	Apparent N.P.D.	C. — O.
	h. m. s.	h. m. s.	s.	° ′ ″	″
	1851, 52. VICTORIA.				
1	Nov. 4.. 12. 48. 55	8. 14. 18, 46		77. 16. 3, 0	
2	18.. 12. 29. 49	8. 18. 8, 54		78. 23. 28, 4	
3	22.. 13. 39. 30	8. 18. 20, 61		78. 40. 54, 7	
4	24.. 13. 0. 43	8. 18. 17, 94		78. 48. 55, 1	
5	27.. 13. 15. 19	8. 18. 1, 17		79. 0. 31, 0	
6	28.. 13. 17. 56	8. 17. 52, 50		79. 4. 12, 9	
7	Dec. 21.. 13. 2. 12	8. 7. 13, 67		80. 2. 7, 4	
8	22.. 11. 28. 0	8. 6. 30, 83		80. 3. 16, 8	
9	22.. 12. 11. 16	8. 6. 29, 51		80. 3. 18, 6	
10	Jan. 12.. 11. 46. 5	7. 46. 40, 08	− 4, 57	80. 1. 43, 1	− 12, 7
11	17.. 9. 49. 9	7. 41. 28, 90	4, 20	79. 54. 39, 5	16, 2
12	17.. 13. 19. 28	7. 41. 19, 98	4, 49	79. 54. 25, 1	16, 5
13	18.. 12. 53. 29	7. 40. 17, 84	4, 18	79. 52. 44, 1	17, 4
14	19.. 9. 9. 51	7. 39. 24, 60	3, 96	79. 51. 17, 8	(− 22, 4)
15	23.. 10. 19. 11	7. 35. 14, 29	4, 12	79. 43. 4, 5	13, 9
16	23.. 12. 30. 57	7. 35. 8, 78	4, 19	79. 42. 54, 6	15, 9
17	24.. 11. 41. 26	7. 34. 10, 28	4, 18	79. 40. 45, 9	14, 0
18	24.. 12. 29. 0	7. 34. 8, 45	4, 34	79. 40. 44, 8	17, 3
19	25.. 9. 44. 52	7. 33. 15, 02	4, 05	79. 38. 44, 0	16, 1
20	25.. 12. 12. 32	7. 33. 8, 92	4, 08	79. 38. 28, 7	14, 8
21	26.. 10. 15. 31	7. 32. 14, 41	4, 03	79. 36. 20, 8	14, 5
22	28.. 8. 51. 28	7. 30. 21, 36	3, 94	79. 31. 41, 7	15, 2
23	30.. 8. 54. 46	7. 28. 28, 13	3, 80	79. 26. 41, 1	16, 2
24	31.. 9. 46. 22	7. 27. 31, 26	− 3, 92	79. 23. 59, 4	− 15, 2
25	Feb. 5.. 10. 7. 5	7. 23. 11, 62		79. 10. 22, 7	
26	6.. 9. 0. 7	7. 22. 25, 51		79. 7. 39, 9	
27	9.. 10. 44. 43	7. 20. 5, 16		78. 58. 53, 0	
28	10.. 8. 58. 2	7. 19. 25, 67		78. 56. 9, 0	
29	13.. 12. 42. 12	7. 17. 19, 41		78. 46. 49, 7	
30	15.. 8. 57. 13	7. 16. 12, 31		78. 41. 22, 6	
31	21.. 9. 58. 8	7. 13. 9, 98		78. 23. 15, 5	
32	22.. 9. 51. 13	7. 12. 45, 53		78. 20. 18, 7	
	1852. FLORA.				
1	Mar. 2.. 12. 50. 20	12. 49. 50, 72		85. 50. 17, 2	
2	3.. 12. 6. 36	12. 49. 11, 21		85. 43. 7, 2	
3	9.. 12. 28. 15	12. 44. 37, 29	− 9, 78	84. 57. 25, 3	− 59, 2
4	24.. 14. 33. 25	12. 30. 38, 68	− 10, 06	83. 3. 4, 5	− 54, 4

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps	Apparent N.P.D.	Comps.
		h. m. s.		° ′ ″	
		For Victoria.			
1	91	8. 14. 58, 00	8	77. 20. 29, 2	4
2	93	8. 18. 42, 21	12	78. 29. 36, 6	5
3	92	8. 15. 48, 46	24	78. 53. 38, 6	8
4	92	48, 52	22	38, 8	8
5	92	48, 61	24	39, 3	8
6	92	48, 64	23	39, 4	8
7	89	8. 4. 49, 36	24	79. 58. 57, 3	8
8	89	49, 38	24	57, 4	8
9	90	8. 8. 12, 46	24	80. 8. 36, 8	8
10	87	7. 49. 22, 71	21	80. 7. 26, 7	7
11	85	7. 40. 6, 36	21	79. 55. 18, 6	7
12	84	7. 39. 27, 93	22	80. 0. 55, 2	8
13	83	7. 37. 32, 71	15	79. 47. 15, 8	5
14	83	32, 72	3	15, 9	1
15	83	32, 74	24	16, 1	8
16	79	7. 26. 51, 84	12	79. 42. 47, 1	4
17	79	51, 84	15	47, 2	5
18	82	7. 29. 27, 45	15	79. 38. 17, 9	6
19	82	27, 45	10	18, 0	5
20	80	7. 27. 4, 51	24	79. 33. 49, 2	8
21	82	7. 29. 27, 46	12	79. 38. 18, 1	6
22	80	7. 27. 4, 52	20	79. 33. 49, 4	7
23	81	7. 29. 11, 21	16	79. 22. 21, 0	8
24	81	11, 21	23	21, 1	8
25	78	7. 25. 56, 43	16	79. 7. 3, 1	8
26	78	56, 43	24	3, 2	8
27	77	7. 23. 31, 15	9	78. 57. 52, 6	3
28	77	31, 15	12	52, 6	4
29	74	7. 15. 49, 60	24	78. 48. 47, 0	8
30	76	7. 18. 30, 49	10	78. 42. 6, 2	5
31	73	7. 10. 2, 98	24	78. 18. 52, 6	8
32	73	2, 97	18	52, 6	6
		For Flora.			
1	126	12. 48. 9, 77	24	85. 47. 55, 3	8
2	126	9, 79	18	55, 4	6
3	125	12. 46. 9, 72	18	84. 57. 27, 2	6
4	124	12. 32. 13, 13*	18	83. 4. 14, 9	6

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	Log. $\frac{p}{P}$.	Apparent N.P.D.	Log. $\frac{q}{P}$.
	h. m. s.	h. m. s.	s.	° ′ ″	″
	1850. PARTHENOPE.				
1	June 1.. 12. 50. 39	15. 2. 38, 18	+8, 356	99. 46. 49, 4	−9, 9455
	1850. BOND'S COMET.				
1	Sept. 13.. 13. 44. 55	7. 2. 18, 01	−8, 751	43. 6. 8, 3	−9, 7344
2	16.. 13. 45. 23	7. 42. 46, 69	−8, 700	49. 57. 57, 0	−9, 8163
3	17.. 15. 1. 49	7. 55. 37, 92	−8, 676	52. 41. 12, 5	−9, 7600
	1850. EGERIA.				
1	Nov. 21.. 7. 15. 48	1. 43. 30, 06	−8, 381	81. 19. 17, 2	−9, 8664
2	21.. 12. 39. 21	1. 43. 19, 37	+8, 425	81. 18. 31, 5	9, 8693
3	27.. 12. 21. 43	1. 39. 8, 95	+8, 445	80. 58. 7, 6	9, 8690
4	28.. 11. 9. 24	1. 38. 35, 10	+8, 271	80. 54. 31, 7	9, 8591
5	Dec. 6.. 7. 20. 35	1. 34. 53, 88	−8, 126	80. 21. 20, 7	9, 8516
6	6.. 10. 8. 2	1. 34. 51, 36	+8, 165	80. 20. 49, 9	9, 8524
7	8.. 11. 28. 21	1. 34. 12, 18	+8, 435	80. 11. 1, 9	9, 8637
8	9.. 7. 8. 27	1. 33. 58, 90	−8, 120	80. 6. 57, 7	9, 8497
9	9.. 11. 25. 24	1. 33. 56, 05	+8, 434	80. 6. 1, 8	9, 8637
10	12.. 8. 52. 55	1. 33. 19, 09	7, 805	79. 51. 12, 6	9, 8450
11	19.. 12. 5. 38	1. 32. 53, 02	8, 551	79. 10. 59, 2	9, 8767
12	20.. 8. 30. 3	1. 32. 55, 79	7, 900	79. 5. 47, 2	9, 8392
13	21.. 10. 49. 14	1. 33. 1, 37	8, 462	78. 59. 4, 0	9, 8601
14	23.. 8. 40. 53	1. 33. 15, 88	8, 073	78. 47. 6, 9	9, 8394
15	23.. 10. 37. 23	1. 33. 16, 36	8, 455	78. 46. 33, 9	9, 8577
16	26.. 8. 14. 20	1. 33. 50, 41	7, 961	78. 27. 47, 9	9, 8353
17	27.. 9. 59. 33	1. 34. 6, 43	8, 408	78. 20. 44, 2	9, 8501
18	28.. 10. 15. 50	1. 34. 23, 17	+8, 451	78. 13. 54, 3	−9, 8535
	1851. IRENE.				
1	May 22.. 10. 40. 23	16. 1. 15, 43	−8, 168	103. 28. 0, 3	−9, 9620
2	26.. 11. 0. 57	15. 57. 14, 29	−7, 905	103. 35. 10, 9	, 9654
3	28.. 10. 22. 23	15. 55. 17, 95	−8, 810	103. 39. 6, 1	, 9634
4	28.. 11. 28. 55	15. 55. 15, 39	−7, 207	103. 39. 12, 5	, 9669
5	29.. 12. 4. 14	15. 54. 15, 57	+7, 730	103. 41. 20, 3	, 9664
6	30.. 11. 33. 0	15. 53. 19, 65	+5, 000	103. 43. 27, 8	, 9666
7	31.. 10. 34. 53	15. 52. 24, 54	−7, 922	103. 45. 36, 9	, 9659
8	June 4.. 10. 38. 1	15. 48. 44, 33	−7, 644	103. 55. 18, 5	, 9673
9	4.. 11. 11. 34	15. 48. 43, 15	+5, 557	103. 55. 21, 0	, 9678
10	5.. 10. 26. 11	15. 47. 52, 16	−7, 751	103. 57. 54, 8	, 9675
11	10.. 12. 11. 41	15. 43. 43, 27	+8, 210	104. 13. 16, 5	, 9628
12	12.. 12. 10. 4	15. 42. 14, 32	8, 240	104. 18. 33, 9	, 9624
13	15.. 11. 11. 20	15. 40. 12, 83	8, 005	104. 28. 18, 4	, 9672
14	15.. 12. 16. 45	15. 40. 11, 28	8, 314	104. 28. 24, 8	, 9594
15	16.. 11. 25. 11	15. 39. 34, 48	8, 123	104. 31. 43, 5	, 9656
16	17.. 11. 51. 12	15. 38. 57, 30	8, 258	104. 35. 17, 9	, 9622
17	26.. 11. 41. 30	15. 34. 43, 30	8, 354	105. 10. 12, 8	, 9588
18	26.. 12. 6. 6	15. 34. 42, 84	8, 415	105. 10. 17, 1	, 9540
19	28.. 11. 42. 53	15. 34. 5, 61	8, 382	105. 18. 43, 6	, 9573
20	29.. 11. 20. 52	15. 33. 49, 44	8, 332	105. 23. 1, 5	, 9607
21	29.. 11. 48. 24	15. 33. 49, 58	8, 405	105. 23. 9, 2	, 9554
22	30.. 11. 19. 47	15. 33. 35, 30	8, 343	105. 27. 28, 8	, 9601
23	July 4.. 11. 22. 1	15. 32. 55, 23	+8, 393	105. 45. 50, 0	−9, 9573

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps.	Apparent N.P.D.	Comps.
		h. m. s.		° ′ ″	
		PARTHENOPE.			
1	150	15. 3. 36, 16	11	99. 56. 15, 8	4
		For COMET.			
1	75	7. 17. 9, 98	9	43. 11. 7, 0	3
2	86	7. 43. 16, 45	5	50. 8. 22, 4	5
3	88	7. 53. 33, 99	12	52. 27. 10, 5	4
		For EGERIA.			
1	41	1. 41. 19, 34	24	81. 28. 9, 6*	8
2	44	1. 44. 46, 07	18	81. 9. 6, 8	6
3	42	1. 41. 23, 26	24	81. 3. 34, 1	8
4	43	1. 42. 25, 69	24	80. 55. 54, 7	8
5	38	1. 34. 43, 54	8	80. 30. 34, 5	8
6	30	1. 30. 24, 90	20	80. 15. 9, 3	7
7	30	24, 89	23	9, 4	8
8	34	1. 31. 33, 90	23	80. 5. 9, 1	8
9	40	1. 39. 15, 03	15	79. 54. 12, 8	5
10	40	15, 01	24	12, 9	8
11	36	1. 33. 43, 35	15	79. 7. 34, 5	5
12	36	43, 34	24	34, 6	8
13	35	1. 32. 25, 51*	16	78. 52. 41, 0*	8
14	29	1. 29. 45, 10	24	78. 41. 3, 9	8
15	28	1. 29. 12, 00	18	78. 37. 23, 8	6
16	28	11, 96	24	24, 0	8
17	33	1. 31. 15, 73*	24	78. 19. 19, 0*	8
18	33	15, 72*	18	19, 0*	6
		For IRENE.			
1	167	15. 59. 53, 78	12	103. 32. 1, 6	4
2	166	15. 58. 46, 89	21	103. 39. 59, 1	7
3	166	46, 90	24	59, 0	8
4	164	15. 49. 52, 76	18	103. 50. 44, 6	6
5	164	52, 76	24	44, 5	8
6	164	52, 77	6	44, 5	2
7	164	52, 78	21	44, 5	7
8	164	52, 80	24	44, 4	8
9	163	15. 47. 55, 19	15	103. 57. 25, 3	5
10	164	15. 49. 52, 81	24	103. 50. 44, 4	8
11	161	15. 44. 58, 31	24	104. 15. 55, 0	8
12	161	58, 32	12	54, 9	4
13	159	15. 43. 18, 00	7	104. 24. 32, 9	7
14	157	15. 35. 5, 68	18	104. 33. 41, 4	6
15	157	5, 68	24	41, 4	8
16	157	5, 68	12	41, 4	4
17	155	15. 33. 41, 52	24	105. 5. 4, 2	8
18	158	15. 35. 43, 56	23	105. 11. 38, 3	8
19	158	43, 55	8	38, 3	4
20	158	43, 55	20	38, 2	7
21	156	15. 34. 25, 58	12	105. 31. 55, 4	6
22	156	25, 57	23	55, 4	8
23	156	25, 55	17	55, 3	6

OBSERVATORY, DURHAM.

EQUATOREAL OBSERVATIONS.

Set.	Greenwich Mean Time.	Apparent R.A.	Log $\frac{p}{P}$.	Apparent N.P.D.	Log. $\frac{q}{P}$.
	h. m. s.	h, m. s.	s.	° ′ ″	″
	1851. EUNOMIA.				
1	Sept. 12.. 8. 9. 0	18. 14. 4, 26	+8, 172	112. 59. 58, 2	−9, 9820
2	13.. 8. 12. 34	18. 14. 40, 22	8, 158	112. 56. 25, 7	, 9824
3	15.. 8. 25. 0	18. 15. 56, 84	8, 245	112. 49. 21, 9	, 9791
4	21.. 8. 20. 27	18. 20. 18, 77	+8, 301	112. 28. 34, 4	−9, 9757
	1851. BRORSEN'S COMET.				
1	Aug. 19.. 11. 0. 19	14. 30. 55, 03	+8, 697	50. 8. 1, 9	−9, 8100
2	20.. 10. 57. 16	14. 33. 21, 59	8, 603	49. 38. 47, 6	, 8058
3	21.. 10. 9. 15	14. 35. 46, 43	8, 702	49. 10. 19, 8	, 7474
4	26.. 10. 45. 9	14. 49. 24, 56	8, 724	46. 39. 43, 6	, 7820
5	30.. 10. 38. 37	15. 1. 43, 41	8, 739	44. 37. 17, 1	, 7637
6	Sept. 1.. 12. 52. 51	15. 8. 49, 47	8, 661	43. 31. 39, 9	, 9034
7	5.. 9. 56. 7	15. 23. 23, 53	8, 759	41. 29. 57, 0	, 6733
8	21.. 10. 57. 29	16. 56. 41, 45	+8, 842	33. 35. 24, 3	−9, 6429
	1851. D'ARREST'S COMET.				
1	Aug. 24.. 14. 49. 36	3. 48. 54, 91	−8, 426	85. 8. 58, 1	−9, 8892
2	30.. 13. 52. 42	3. 59. 41, 19	8, 499	86. 24. 45, 2	, 8982
3	Sept. 1.. 14. 30. 19	4. 2. 53, 79	8, 428	86. 51. 11, 1	, 8972
4	6.. 14. 33. 29	4. 9. 52, 22	−8, 395	87. 59. 52, 9	−9, 9016
	1852. EGERIA.				
1	Jan. 25.. 13. 48. 47	12. 25. 42, 94	−8, 387	68. 58. 49, 2	−9, 7722
2	25.. 14. 22. 55	12. 25. 43, 39	8, 284	68. 58. 42, 1	, 7602
3	28.. 12. 33. 21	12. 25. 53, 82	8, 514	68. 45. 3, 3	, 7992
4	28.. 13. 12. 19	12. 25. 53, 81	8, 446	68. 44. 54, 7	, 7806
5	28.. 14. 41. 31	12. 25. 54, 03	8, 154	68. 44. 36, 7	, 7492
6	30.. 12. 58. 28	12. 25. 51, 72	8, 460	68. 35. 6, 0	, 7819
7	31.. 12. 21. 44	12. 25. 47, 44	8, 515	68. 30. 10, 1	, 7973
8	Feb. 3.. 12. 15. 51	12. 25. 23, 15	8, 506	68. 14. 29, 2	, 7921
9	5.. 14. 2. 37	12. 24. 55, 91	8, 187	68. 3. 12, 0	, 7432
10	6.. 13. 39. 30	12. 24. 39, 98	8, 268	67. 57. 47, 6	, 7480
11	10.. 12. 36. 14	12. 23. 16, 43	8, 409	67. 35. 38, 1	, 7621
12	10.. 13. 20. 7	12. 23. 15, 71	8, 277	67. 35. 26, 7	, 7445
13	13.. 13. 21. 39	12. 21. 51, 26	8, 221	67. 18. 26, 2	, 7369
14	17.. 12. 40. 53	12. 19. 32, 95	8, 306	66. 56. 11, 5	, 7405
15	18.. 12. 29. 32	12. 18. 53, 54	8, 330	66. 50. 44, 4	, 7423
16	19.. 13. 24. 49	12. 18. 10, 98	8, 056	66. 45. 2, 2	, 7222
17	25.. 11. 36. 24	12. 13. 31, 95	8, 391	66. 14. 41, 7	, 7447
18	27.. 12. 30. 45	12. 11. 43, 63	8, 152	66. 5. 15, 3	, 7183
19	Mar. 2.. 11. 55. 16	12. 7. 56, 93	8, 233	65. 48. 56, 9	, 7217
20	3.. 11. 16. 10	12. 6. 58, 80	8, 356	65. 45. 23, 0	, 7333
21	9.. 11. 17. 14	12. 0. 42, 14	8, 249	65. 27. 58, 1	, 7175
22	12.. 12. 0. 21	11. 57. 24, 08	−7, 867	65. 22. 31, 7	, 7006
23	20.. 12. 4. 24	11. 48. 33, 95	+6, 888	65. 20. 17, 1	, 6971
24	24.. 11. 17. 6	11. 44. 19, 21	−7, 625	65. 26. 5, 6	, 6995
25	27.. 10. 47. 37	11. 41. 15, 21	−7, 898	65. 33. 27, 0	−9, 7066

ASSUMED POSITIONS OF STARS.

Set.	Star.	Apparent R.A.	Comps.	Apparent N.P.D.	Comps
		h. m. s.		° ′ ″	
		For Eunomia.			
1	173	18. 16. 8, 00	4	113. 3. 14, 0	4
2	173	7, 98	24	14, 0	8
3	172	18. 13. 2, 63	24	112. 59. 1, 6	8
4	174	18. 23. 33, 47	21	112. 23. 35, 1	7
		For Comet.			
1	139	14. 28. 51, 09	18	49. 54. 56, 0	6
2	141	14. 34. 48, 56	15	49. 27. 50, 6	5
3	144	14. 37. 57, 66	8	48. 54. 14, 7	3
4	146	14. 50. 31, 81	7	46. 36. 0, 2	3
5	149	14. 57. 50, 74	14	44. 46. 0, 1	5
6	151	15. 4. 33, 90	5	43. 41. 53, 5	5
7	154	15. 24. 38, 86	6	41. 46. 5, 9	6
8	170	17. 5. 4, 90	5	33. 38. 5, 5	5
		For Comet.			
1	69	3. 49. 55, 51	4	84. 56. 58, 1	4
2	70	3. 56. 14, 65	4	86. 34. 17, 9	4
3	71	4. 7. 1, 48	5	87. 0. 34, 6	5
4	72	4. 9. 33, 68	8	87. 50. 22, 8	8
		For Egeria.			
1	114	12. 23. 52, 43	24	68. 57. 30, 1	8
2	119	12. 29. 24, 66	18	68. 56. 56, 2	6
3	117	12. 26. 2, 74	14	68. 44. 53, 6	6
4	112	12. 20. 39, 10	18	68. 49. 37, 9	6
5	121	12. 30. 52, 26	15	68. 43. 19, 0	5
6	122	12. 31. 13, 27	15	68. 27. 58, 6	7
7	122	13, 30	10	58, 7	5
8	116	12. 24. 44, 86	12	68. 15. 52, 2	4
9	123	12. 31. 45, 63	18	68. 7. 27, 8	6
10	120	12. 29 47, 80	24	67. 59. 15, 5	8
11	118	12. 27. 24, 18	24	67. 38. 12, 1	8
12	115	12. 24. 9, 82	24	67. 36. 24, 3	8
13	113	12. 22. 55, 85	24	67. 14. 1, 3	8
14	110	12. 17. 4, 46	23	67. 0. 45, 5	8
15	111	12. 17. 18, 18*	18	66. 48. 41, 0	6
16	109	12. 14. 57, 60	24	66. 42. 57, 1	8
17	108	12. 11. 51, 17	11	66. 8. 39, 1	4
18	108	51, 20	22	39, 0	7
19	107	12. 4. 14, 86	17	65. 51. 18, 4	6
20	107	14, 87	24	18, 4	8
21	106	12. 0. 30, 74	12	65. 28. 32, 5	6
22	106	30, 77	18	32, 3	6
23	105	11. 45. 15, 08	18	65. 23. 48, 5	6
24	105	15, 09	18	48, 0	6
25	104	11. 32. 43, 51	9	65. 34. 53, 4	3

When not otherwise stated, it may be concluded that the observations were taken with the wire-micrometer, with the wires faintly illuminated in a dark field.

All the observations are duly corrected for refraction.

1850. JUNO. The parallax and computed positions have been taken from the Naut. Alm. for 1850.

1850. IRIS. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1853.

1850. DR. PETERSEN'S THIRD COMET. For the first 7 sets, a micrometer provided with five R.A. bars and two moveable N.P.D. bars was used, the comet being too faint to be seen under any illumination. The observations are deficient in precision at this time. Apart from its faintness, the position of the object at the time was extremely awkward, being a little north of the Zenith, a case in which no provision was made for the observer's comfortable support. Cloudy weather succeeded after July 15, and prevented further observation.

The parallax and computed positions have been taken from the Ephemeris published by Mr. Sonntag in No. 798 of the *Astron. Nachrichten.*

I have some time since published a final discussion of this Comet's orbit, supplementary to MR. Sonntag's, in No. 867 of the *Astron. Nach.*, in which I have included the latest observations taken at the Cape of Good Hope, and thereby, as I believe, established the existence of a slight but appreciable ellipticity.

1850. FLORA. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1853.

1850. VICTORIA. The parallax and computed positions have been taken from the Ephemeris of M. Villarceau, published in the *Comptes Rendus*, vol. 31, p. 681. When previously provisionally published, the differences of N.P.D. were found from an assumed value of the micrometer-screw, in which a term was introduced for variation from the effect of temperature. This small correction, not having been confirmed by subsequent observations, has here again been dropped, and the N.P.D.s are here found on the assumption of a uniform value of 1 rev. = 20″,000.

1850-51. METIS. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1854. Sets 6 and 10 were observed with the transit-circle.

1851. HEBE. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1854. The planet shone as a star of about the 8th magnitude. Sets 2 to 7 were all observed very favourably.

1851. IRIS. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1854. The planet shone as a star of the 7½ magnitude.

1851. HYGEIA. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1854. The planet shone as a star of the 10½ magnitude.

1851. PALLAS. The parallax and computed positions have been taken from the Naut. Alm. for 1851.

1851. PARTHENOPE. The parallax and computed positions have been taken from MM. Luther and Vogel's Ephemeris, given in No. 773 of the *Astron. Nach.* The interpolations have been performed by second differences for the Greenwich mean time of observation, increased by the longitude of Berlin and diminished by the aberration-time; it having been inferred that the Ephemeris gives *true* and not *apparent* positions.

The star used for set 8, namely, B.A.C. 793, has a conspicuous proper motion.

1852. ENCKE'S COMET. The parallax and computed positions have been taken from the Supplement to the Naut. Alm. for 1855. The comet was first seen at Durham on the 12th of January, and again on the 16th, but on both nights high winds prevented more than a rough estimation of its position. On the 17th it was a little brighter, but still very faint, and the measures were in consequence taken with the ring-micrometer. On and after the 8th of February the comet was considerably brighter, and exhibited a strong condensation of central light, which admitted of accurate observation with the wire-micrometer. On the earlier evenings the coma seemed to spread slightly towards the south-following direction, but subsequently no elliptical form was perceived. The whole extent of the coma was below two minutes of arc in all cases.

1851-52. VICTORIA. The parallax and computed positions have been taken from the Supplement to the Naut. Alm for 1855. The planet shone as a star of less than the 10th magnitude. Sets 19, 21, 23, 25, and 30 were taken with the hearing-tube.

1852. FLORA. The parallax and computed positions have been taken from the Supplement to the Naut Alm for 1855. The planet shone as a star of the 9½ magnitude.

The observations to which the following notes refer are not corrected for parallax; but the factors for its ready application are given in the form Log. $\frac{p}{P}$, Log. $\frac{q}{P}$; P being the E. H. parallax in seconds of arc, and p and q the corrections required in R.A and N.P.D. respectively.

1850. PARTHENOPE. The only observation taken at Durham during the first opposition.

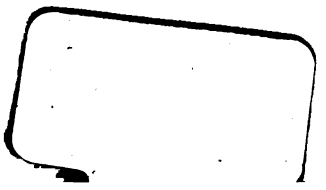
1850. BOND'S COMET. For the first two observations the bar-micrometer, and for the last the wire-micrometer was used. The comet was in all cases too faint for satisfactory observation. It was last seen on the 17th of September, when it was thought to be a little elongated in the north —following direction. No nucleus could be perceived.

1850. EGERIA. The planet shone as a star of the 10th magnitude.

1850. IRENE. No remark required.

1851. EUNOMIA. The planet was not detected on first receiving notice of its discovery, and some days' observation were thus lost. When found it was already so faint that it was not found possible to follow it long.

1851. BRORSEN'S FOURTH COMET. No nucleus was traceable. The comet was very faint and difficult to observe. The ring-micrometer was used for the three last sets.

1851. D'ARREST'S COMET. No nucleus was seen. The observations are in consequence not very precise. The wire-micrometer was used for the first set, the ring-micrometer for the three last. Between July 18 and August 18 no observation was procured, in consequence of my absence in Sweden on the occasion of the total eclipse of the sun.

1852. EGERIA. The planet shone as a star of fully the 10th magnitude. The Ephemeris in the *Berliner Jahrbuch* was not thought to be sufficiently accurate to be used for the application of parallax.